Vol. 194 83rd Year No. 3553

THE GAS JOURNAL

JUNE 24, 1931

A Glance at the Contents—

Institution of Gas Engineers.

We publish to-day further written communications relating to the papers by Mr. Holton, Dr. Lessing, and Mr. Clegg. [p. 952.]

Working of 10-ft. Purifiers.

This subject is dealt with by Mr. J. H. Richmond, of York, who refers to a plant which was constructed and put to work in 1928. Several interesting features are embodied in its design. [p. 944.]

Stockton Corporation's Enterprise.

This month has witnessed the inauguration of new showrooms by the Stockton Gas Department. The premises are situated in a central position in the town, and are of an elegant nature. [p. 935.]

Visit to the Alloa Gas-Works.

The works of the Alloa Gas Department were inspected by the Scottish Junior Gas Association (Eastern District) on June 13. The factory of the Alloa Glass Works Company, Ltd., was also visited. [p. 948.]

New Carbonizing Plant at Saltcoats.

Last Wednesday an installation of Woodall-Duckham continuous vertical retorts was inaugurated at the works of the Saltcoats Gas Company. The plant is capable of carbonizing 22·4 tons of coal a day, and of producing 448,000 c.ft. of gas of a calorific value of 430 B.Th.U. per c.ft. [p. 934.]

Lighting Research at the N.P.L.

A brief sketch by Dr. J. W. T. Walsh is published showing the nature of the work in the Photometry Division of the National Physical Laboratory and the kind of problem which is investigated there under the auspices of the Illumination Research Committee. This Committee has no counterpart in any other country, and there is no doubt that its publications are carefully studied by illuminating engineers throughout the world. [p. 936.]

The British Chemical Industry.

Next month the Society of Chemical Industry will celebrate its Jubilee, the dates arranged being July 13-19. In connection with this important occasion, Dr. Stephen Miall has written a book entitled "A History of the British Chemical Industry." Dr. Miall, who is Editor of "Chemistry and Industry," is peculiarly fitted for the task he has so well accomplished. A review of the book is published to-day. [p. 932.]

Distribution Engineer and Sales Manager for Bristol.

As will be seen from our advertisement columns, the Directors of the Bristol Gas Company are inviting applications for the position of Distribution Engineer and Sales Manager, to be responsible under the Management for mains and services, meters, internal fittings and appliances, and attention to complaints; also the organization of industrial and domestic gas sales, showrooms, and propaganda. Applicants must have thorough technical and commercial experience in modern distribution practice and business development. The commencing salary is £900 per annum. [p. 962.]

Gas for Street Lighting.

Mr. F. W. Hickling gives an account of photometric tests on modern reflecting devices. The opportunity for carrying out these experiments was afforded by the construction of a new by-pass road in Bradford. [p. 946.]

A Visit to Richmonds' Grappenhall Works.

Wednesday, June 17, marked the Annual Ladies' Day of the Manchester and District Junior Gas Association, and they synchronized this popular event with a visit to Richmonds' Works at Grappenhall, Warrington. [p. 949.]

Education in Industry and Commerce.

Speaking at the thirteenth annual conference of the Association for Education in Industry and Commerce, Sir David Milne-Watson referred to the question of examinations as a standard qualification demanded by many firms in the selection of candidates for posts. [p. 930.]

Free Services and Unaccounted-for Gas.

Several senior members of the Industry have replied to questions asked by the Scottish Junior Gas Association (Eastern District). In to-day's "JOURNAL" Mr. J. Kincaid, of Kirkcaldy, deals with free services, while a query on unaccounted-for gas is replied to by Mr. David Vass, of Perth. [p. 947.]

London Juniors' Summer Visit.

Last Saturday the London and Southern District Junior Gas Association visited the works of their President, Mr. T. H. Prater, at Margate. Both the works and the new district showrooms at Cliftonville were inspected, and the visitors were also entertained at lunch at the Norfolk Hotel at the invitation of the Management of the Isle of Thanet Gas Company. [p. 951.]

Report of the Chief Alkali Inspector.

The Sixty-Seventh Annual Report on Alkali, &c., Works, for the year 1930, which has just been issued, is, as usual, of great interest to the Gas Industry; and several of the subjects briefly reviewed by Mr. W. A. Damon, the Chief Alkali Inspector, are emphasized in our Editorial Columns to-day. Statistics relating to ammonia and tar are also published. [p. 931.]

New Showrooms at Dewsbury.

The Dewsbury Corporation propose to build showrooms for the Gas Department. Tenders for the work have been approved by the Town Council. The sanction of the Ministry of Health to borrow the money required for the scheme is now being asked, and work will be commenced within a few weeks. It is estimated that the construction will occupy about six or seven months. [p. 953.]

Development of the Glover-West System.

In his Address as Chairman of the North of England Gas Managers' Association (Auxiliary Section) Mr. J. E. Dixon, of Newcastle, has some very interesting things to say about the development of the Glover-West vertical retort. Continuously-operated retorts on this system have been at work at the Elswick Works of the Newcastle-upon-Tyne and Gateshead Gas Company for over eighteen years. [p. 940.]

EDITORIAL NOTES

Empire First

As a consequence of informal meetings during the Imperial Conference last year, it was arranged for the Federation of British Industries to send a mission to Canada to discuss with manufacturers, industrialists, and leaders of commerce the best means of promoting reciprocal trade between Canada and Great Britain; and those selected for this mission were Sir James Lithgow (President of the Federation), Sir Arthur Duckham (President-Elect), and Mr. Moir Mackenzie. The mission were impressed with the desire of the Dominion to purchase goods from Great Britain and other Dominions in preference to purchasing from foreign countries; but they point out that the distance and difficulty of communication between Canada and Great Britain handicap trade and necessitate greater efforts in salesmanship and service. The report of the mission is a useful document, as it indicates ways in which the Federation of British Industries can take action to assist reciprocal trading.

The first point on which the mission lay particular emphasis is that to all component parts of the Empire the welfare of the Empire as a whole—industrially even more than politically—is of paramount importance. In this connection they suggest as a slogan " Empire First," and we would pass it on as the expression of a vital sentiment. Here are the words of the report: " The Dominions as separate entities are not great nations, and Great Britain without the Empire loses its unique world position. Politicians, the public Press, and public speakers have raised the cries of ' Great Britain first,' ' Canada first,' ' Australia first,' ' South Africa first,' and have introduced thereby an undesirable atmosphere of rivalry into Empire discussions; but inasmuch as Empire unity is essential for the continuing welfare of the British races, national policies should follow the larger issue, and the one cry should be ' Empire first.' "

Evolution and Modification

In his Address as Chairman of the North of England Gas Managers' Association (Auxiliary Section) Mr. J. E. Dixon, of Newcastle, had some very interesting things to say about the development of the Glover-West vertical retort. Continuously-operated retorts on this system have been at work at the Elswick Works of the Newcastle-upon-Tyne and Gateshead Gas Company for over eighteen years. During this period there has been ample opportunity for experiment and improvement; and Mr. Dixon's story is well worth reading. The carbonizing plant at Elswick was reconstructed in 1911, and the plant still exists except for one bench, which is being rebuilt to incorporate the 1931 " New Model " design of retort.

Mention may be made here of some of the results of the experimental work which Mr. Dixon describes. It was proved, for example, that there is a limit to the useful length of a retort of a given minor axis, and that, other things being equal, a longer major axis is the chief factor controlling carbonizing capacity. Again, states Mr. Dixon, it might be supposed that a standard retort capable of adequately carbonizing a non-caking coal would present difficulties when dealing with the behaviour of a strongly caking coal; yet most satisfactory carbonization is possible, provided that the operators give the necessary attention to the work and take advantage of the setting design, which provides for the variable adjustment of the distribution of the heat throughout the length of the retort and the rate of coke extraction. Inattention to seemingly trivial detail is the root of many undesirable occurrences, and eventually necessitates additional labour requirements; whereas competent and constant supervision not only secures easier working but ensures maximum results.

A section of the Address is concerned with the use of coal gas for firing vertical settings; and it speaks well for both the quality of coke produced at Elswick and the sales organization of the Newcastle Company that the demand for vertical coke increased so much that by the end of last year it became desirable to gain experience of coal gas firing, to make available for the market coke otherwise required for the producers. The difficulties encountered in burning a gas of 500 B.Th.U. in a setting designed for producer gas are described by Mr. Dixon. Producer gas yields a calculated volume of gaseous products more than twice the figure obtained from 500 B.Th.U. coal gas. The lowering of the quality by dilution with inert gases from the chimney was attempted, and lines followed by other investigators were adopted. The gas feed pipes were so arranged as to act as a set of injectors drawing inert waste gases into the mixing pipes with open ends as burners. A measure of success has been achieved, but Mr. Dixon remarks that there are many problems to solve in connection with this arrangement.

Among other matters dealt with by the author are purification and ammonium sulphate manufacture. Regarding the former he discusses the use of catch boxes before working boxes. He explains that the maximum winter output of gas increased so rapidly that it was only possible, on the limited ground space available, to arrange for four boxes with one catch box. The two other sections of purifiers were without catch boxes. Therefore the " relief " or " catch " box was built with an arrangement of connections so that the gas of any stream from the scrubbers could be passed through and on to the inlets of the working sections. In normal operation a section at work has at least the last two boxes clean, and changes in rotation are made before hydrogen sulphide shows on the outlet of the third box. If delay in changing results in one clean box only, then the catch box is placed in front of the set, and, owing to its position where the concentration of sulphuretted hydrogen is high, it will quickly come into use and reduce the work to be done by the section. Further, after a short time the third box will be clean again and permit the change round to be made with confidence. " This ' catch box first ' method," remarks Mr. Dixon, " has exceptional recommendations. When a purifier is laid off to be emptied the relief box is so active that the remaining three boxes clean up almost at once; revivification *in situ* occurs, and with the newly filled box again in rotation there are four very active boxes in excellent condition to make a most advantageous start. Another desirable feature is the fact that the box to be emptied may run last in the series for days, allowing ample time for partial revivification and cooling of the oxide before exposure to the atmosphere."

On the question of sulphate of ammonia plant, Mr. Dixon speaks of the virtues of seamless copper baskets for centrifuging, and mentions that attention has been given to baskets made of a special metal. One of these baskets has been in use at the Elswick Gas-Works, and dealt with 2500 tons of salt before repairs became necessary.

The Yorkshire Gas Grid Scheme

ANOTHER stage has been reached in the setting up of the Gas Grid Scheme suggested by the recommendations included in the report which the National Fuel and Power Committee (appointed by the Board of Trade) submitted in the autumn of 1928. The issue of the "JOURNAL" containing these recommendations included also a report of the Inaugural Banquet of the World Power Fuel Conference, at which Sir Philip Cunliffe-Lister, at that time President of the Board of Trade, announced that the suggested inquiry into the utilization of surplus coke oven gas would be at once undertaken by the Government. The appointment of the Area Gas Supply Committee followed, their duty being "to make the investigation recommended by the National Fuel and Power Committee into the technical and economic aspects of an area gas supply system." In due course this Committee presented their report (which was reviewed in the "JOURNAL" dated May 28, 1930), recommending the immediate establishment of a gas network in South Yorkshire, with Sheffield as the pivot.

As to the ownership of the network there were two proposals which commanded about equal support among the members of the Committee. The first was that the network should be owned by the Sheffield Gas Company, while the second was that the general principle should be adopted of joint ownership between gas undertakings and coke ovens. Arguments in favour of each alternative were given in the report, but, as we said at the time, there seemed to us to be a *prima facie* case that the Sheffield Gas Company should own the network. "Here," we said, "is a progressive Gas Company which admittedly for many years past has been developing the industrial sale of gas in its area of supply, has been purchasing coke oven gas in large quantities, and has already all the necessary statutory powers to buy and distribute gas." When the time arrived for announcing notices of Private Bills, it was found that two measures were to be promoted to deal with this matter. One was deposited by the Sheffield Gas Company and the other by the South Yorkshire Gas Grid Company, Ltd., which comprises a majority of the coke-oven owners in South Yorkshire. As the result, however, of negotiations between the parties, agreement was reached, and the Grid Company withdrew their Bill. They remain as the organization through which the Sheffield Gas Company are to purchase the coke-oven gas.

The price at which the Sheffield Gas Company are to purchase the coke oven gas from the Grid Company is 5½d. per 1000 c.ft.; there being a sliding scale to vary the figure in accordance with variations in the price of coal. The calorific value of the unpurified coke oven gas is to be 515 B.Th.U., such purification as is necessary being undertaken by the Sheffield Gas Company. On their part, the Sheffield Gas Company undertake to develop as far as they can the sale of coke oven gas for industrial purposes in the area to which their powers relate.

The Parliamentary Inquiry

THOUGH agreement had thus been reached with the coke-oven owners, petitions by certain inside gas undertakings remained to be heard, and a lengthy inquiry has taken place before a Committee of the House of Commons, the proceedings at which will be found fully reported in last week's "JOURNAL" and to-day. The Bill, which is the first presented to Parliament to enable a gas undertaking to construct a coke oven gas network or grid, has now been passed by the Committee, and the Industry is on the threshold of what will doubtless prove to be a development of far-reaching importance. The responsibilities which the Sheffield Gas Company are undertaking will, we hope, prove of advantage to them and to the Gas Industry at large.

When the Committee met for a final settlement of the matter under discussion, clauses were submitted embodying agreements arrived at between the Sheffield Gas Company and the Rotherham Corporation on the one hand, and on the other hand between the Company and the Rawmarsh and Wombwell Urban District Councils, the Wath, Bolton, and Thurnscoe Gas Board, and the Swinton and Mexborough Gas Board. It was seen that, so far as the Rotherham Corporation are concerned, the agreement provides for the maintenance, under stipulated conditions, of the supply of coke oven gas which they are now receiving from the South Yorkshire Chemical Works and the Works of Messrs. John Brown & Co.; the price to be equivalent to a halfpenny per thousand c.ft. above the price paid for the gas by the Sheffield Company. For supplies above 6 million c.ft. per day, the Corporation will pay a price to be agreed upon or determined by arbitration. Clauses inserted in the Bill also embody the agreement with the other inside gas undertakers, giving them the right to obtain from the Sheffield Gas Company supplies of gas at special prices, to replace the supplies they are now obtaining direct from coke ovens in their areas. These prices were quoted as follows in last week's issue of the "JOURNAL:" For industrial use, the price paid by the Sheffield Company to the Grid Company, plus 10 p.ct., and, for domestic use, the price paid by the Sheffield Company, plus 1½d. per 1000 c.ft.; alternatively, they can pay a price for gas for all purposes, equivalent to the price paid by the Sheffield Company, plus 1d. per 1000 c.ft. It should be noted, however, that these prices relate only to supplies replacing those already received by the various undertakers, and not to further quantities they may require from the Sheffield Gas Company.

In the Public Interest

SUBSEQUENT to agreement being reached between the Sheffield Gas Company and the Rotherham Corporation, the Board of Trade pointed out to the Committee that the agreement bound the Sheffield Gas Company to supply to the Corporation up to 6 million c.ft. per day, but there was no obligation on the Corporation to take that supply, and, to the extent that the Corporation did not take it, this gas must be left unused. The Board asked the Committee to bear this in mind from the point of view of the public interest. Counsel for the Corporation, however, maintained that, as the Rotherham Corporation had entirely closed down their own works, as the demand for gas in Rotherham increased the Corporation could meet it by taking more coke oven gas. Similarly, as the demand in Sheffield for gas increased, the Company would take more and more from the coke ovens. All the coke oven gas available would be sold if there were a demand for it, and the question was merely whether, if still more gas were required, it should be manufactured at Rotherham or Sheffield. Mr. Ronca made it clear that the Board did not care whether Rotherham or Sheffield had the gas, so long as it was used, and the Committee decided that the clauses embodying the agreement should be added to the Bill.

An interesting point arose with regard to the South Yorkshire and Derbyshire Gas Company and the Royston (Yorks) and District Gas Company, who intervened during the last stages of the hearing. It was stated by their Counsel (who asked that they should have the right to take gas from the grid on terms not less favourable than those ceded to the Rawmarsh Urban District Council and other opponents, apart from the Rotherham Corporation) that an agreement had been arrived at between the Sheffield Company and the two Companies he represented, whereby the price to be paid by these two Companies for gas from the grid should never exceed by more than 2½d. per 1000 c.ft. the price at which the Sheffield Company bought the gas. He alleged that there had been a misunderstanding; but the Sheffield Company felt that the two Companies, having secured a very favourable agreement, should stand by it. This subject was mentioned again at the final hearing, when the Chairman said that, as an agreement had already been made between the two Companies and the Sheffield Gas Company, the Committee did not wish to hear anything further on the matter. Still the two Companies did not seem satisfied, and Counsel for the Sheffield Company said his clients would meet them if they wished to discuss the question further.

Complaints and Remedies

THE Sixty-Seventh Annual Report on Alkali, &c., Works, for the year 1930, which has just been issued, is, as usual, of great interest to the Gas Industry; and several of the subjects briefly reviewed by Mr. W. A. Damon, the Chief Alkali Inspector, are well worth emphasizing and remembering. He mentions, for example, that a serious complaint was made against a certain firm on account of the emission of black smoke from their annealing furnaces; the firm were advised to burn coke, and its use has not only eliminated complaints, but has proved eminently satisfactory in other directions. Then Mr. Damon refers to the nuisance caused by burning pulverized fuel, and mentions how it is necessary in some cases, in order to get rid of complaints of grit and dirt, to employ washers which consume a vast quantity of water. Complaints have been made relating to the quantities of smoke evolved during the charging of coke ovens. "Several attempts have been made to improve matters, and in some cases a measure of success can be recorded. It is felt, however, that a great deal more could and ought to be done to improve conditions in this respect." It is recorded that on the newer coke ovens, it is usual to fit steam ejectors in each ascension pipe. During the period of charging, steam is turned on and additional suction is thereby applied to the particular oven. Where wet coal is used and if the exhauster is sufficiently sensitively governed to respond quickly to the extra load, a marked reduction may be noticed in the amount of green gas discharged to atmosphere. Greater difficulty is experienced when dry coal is charged, for the evolution of gas is particularly heavy and sudden, commencing immediately charging is started.

Characterizing the heat treatment of high-grade steels as the most difficult problem in connection with smoke abatement, Mr. Damon states that probably the most promising feature is the rapidly extending use of gaseous fuel. "Producer gas may be made at the works, but there are definite disadvantages attendant on its use which do not apply to coal gas. It is possible that coal gas could be used successfully for nearly all the steam heat treatment processes, but up to now its use has been restricted by its price. With the development of a gas network system in the Sheffield district . . . hopes are entertained that it may soon be possible to offer gas to manufacturers at a price which would make it attractive for general industrial purposes." Concerning oil fuel, the Chief Inspector, though observing that in a good installation in the hands of an experienced attendant oil can be used with a minimum of smoke emission, remarks that if reasonable attention is not given, or if the plant is unduly forced, the smoke produced is fully as bad as, if not worse than, that from coal. On quite a different matter, we are glad to note that Mr. Damon endorses the view which has been expressed in the "JOURNAL" on more than one occasion during recent months—that in the present circumstances of trade it behoves manufacturers to anticipate a revival by the reconstruction of their plant, to enable them the more readily to face all types of competition in due course. "Many manufacturers are actively pursuing this policy, and, on the whole, one can say that the resources of the country, so far as chemical plant is concerned, are wider than they were a year ago."

Ammonia and Tar

THE disposal and treatment of ammoniacal liquor come in for a good deal of comment. There are cases, it is remarked, where the liquor is allowed to run to waste, and there are cases where less efficient scrubbing is deliberately practised in order to reduce the make of sulphate, because it is supposed, erroneously of course, that reduction of make means reduction of loss. "It would be better reasoning and more conducive to efficiency if managers of such works would realize that liquor production is an indispensable part of gas manufacture and, considering sulphate manufacture as a means of liquor disposal, would concentrate on the reduction of steam and labour costs. It is unfortunate that a great number of plants have a maximum output of 15 cwt. per day, and are extravagant in labour. Replacement, when existing plant is worn out, by larger units would lead to more intensive working for shorter periods, and to a reduction in labour costs. Production of dry neutral sulphate could be extended with advantage. Many works are still making acid salt, which is less valuable and which is becoming more difficult to sell. In many cases, the plant required could be added at small cost, and would not require extra labour for its operation. In fact, some saving would result, for bagging of the salt could be done by the normal staff of the salt house as it is produced."

It is suggested that the organization of district co-operative schemes, whereby the liquor would be concentrated locally and conveyed to a centre for further working up, might hold out good promise of more efficient and less costly production. As to plant maintenance, Mr. Damon remarks that, considering the lack of profits, this has been good, but that there is a general reluctance to spend capital on improvements. "In a few cases, stills and saturators are being allowed to fall into a lamentably ruinous state through disuse and neglect. This is poor economy, for they will be the more expensive to recondition if and when they are required again. If a plant is worth keeping at all, it should be maintained in order; if not, it should be dismantled."

An extremely interesting Appendix to the Report deals with a piece of important research work on the corrosion of tar stills, the results of which confirm that the corrosion of tar stills is due mainly to the presence in the tar of ammonium chloride, the effect being augmented or accelerated by the presence of other ammonium salts and by the hydrogen sulphide evolved during the distillation, and retarded by the presence of simple phenolic substances. There may, it is stated, be present in the tar substances of an acidic nature, which have not yet been identified with certainty. Such would, presumably, exert a corrosive effect, but under ordinary conditions this effect is certainly less than that due to ammonium chloride. Corrosion increases with increasing temperature. The most interesting and hopeful point emerging is the great diminution in corrosive power observed after extraction of the tar with water. It is proposed during the current year to study the corrosive effect of tars on various metals, alloys, and protective coatings and also the effect of pre-treatment of the tar and addition thereto of inhibiting substances. As we mentioned in these columns last week, Mr. Damon, discussing Dr. Lessing's coal-cleaning process, remarked that the general application of a system of pre-treatment of coal which results in a considerable diminution of the chlorine content should result in a greatly reduced rate of corrosion of tar stills.

Mr. J. W. Young is responsible for the section of the Report dealing with Scotland; and discussing the production of ammonium carbonate as an alternative to sulphate, he observes that experimental work on this subject on a large scale suggests that the product is easier to make than it will be to sell.

PERSONAL

Sir HENRY BIRCHENOUGH, Bt., K.C.M.G., has been elected Chairman of the Imperial Continental Gas Association to fill the vacancy caused by the death of Col. Le Roy-Lewis.

Mr. WILLIAM HENRY ADAMS, of Woodsetton Lodge, Sedgley, for many years Engineer, Manager, and Secretary to the Bilston Gas Light and Coke Company, Ltd., who died on March 11 last, left estate of the gross value of £5381, with net personalty £2886.

Mr. WILLIAM HUGH BLUNDSTONE, B.Sc., Assoc.M.Inst.Gas E., Technical Assistant Engineer to the Dewsbury Gas Department, and son of Mr. and Mrs. Hugh Blundstone, School House, Birstall, was married on June 10, at Knotting Ash Parish Church, Liverpool, to Miss Marie Speirs, of Knotting Ash. The presents included gift of an electric clock from Mr. H. L. Bateman, Dewsbury Borough Gas Engineer and Manager.

THE NEWS OF THE WEEK

The Belfast Corporation has decided to convert the premises, Raleigh House, Queen Street (the property of the Gas Department), into a modern gas showroom.

The Price of Gas in Coupar Angus has been reduced by the Gas Company from 6s. 3d. to 5s. 10d. per 1000 c.ft. It has also been decided to supply gas cookers to consumers on the hire-purchase system.

The Isle of Wight District Association of Gas Engineers on its dissolution recently, unanimously resolved to pay its available funds of £10 to the Benevolent Fund of the Institution of Gas Engineers.

Gas Cookery Demonstrations and Lectures, organized by the Abertillery Gas Department, were held last week and were well attended. All the cooking was carried out on the "Tillery Main" packed cooker which is supplied to slot meter consumers free of hire charges. During the past 18 months 850 of these cookers have been fitted. The demonstrator was Miss M. K. Gompertz, M.C.A., of Messrs. R. & A. Main, Ltd.

The Lancashire, Yorkshire and District Association of Gas Engineers is the new name which the President will propose be adopted by the Manchester District Institution of Gas Engineers at their Ordinary General Meeting to be held at Stretford on Friday, July 3. By the kindness of the Chairman and members of the Stretford and District Gas Board, members are invited to inspect the Gas-Works, and afterwards partake of luncheon at the Town Hall.

Automatic Control of Street Lighting came under discussion recently by the Highways Committee of the Stoke-on-Trent Corporation and the Chairman and Vice-Chairman of the Gas Committee and the Gas Engineer. The Gas Engineer reported on the cost of the installation of the controls and the economies which would be effected thereby, as follows: Estimated expenditure, £6437; estimated annual saving, £3000. It was decided that the scheme for the installation of automatic controls for street lighting be adopted.

Plans for a Shop-Lighting Scheme were outlined by Mr. Wells at a meeting of Camberwell, Peckham, and Dulwich Chamber of Commerce Special Sub-Committee. He suggested that the Chamber should co-operate with the Council and the Lighting Supply Companies, and said that large advertising firms might provide illuminating signs. It was asked whether small shopkeepers could afford the expenditure, and Messrs. Scott and Torry (representing the County of London Electric Supply Company and the South Metropolitan Gas Company respectively) pointed out that cheaper rates were offered for consumption after business hours (in the case of the South Metropolitan Gas Company after eight p.m.).

The Bideford Gas and Coke Company, Ltd., shows a profit for the year ended March 31, 1931, amounting to £3988, which, added to the amount brought forward of £2571, makes a total of £6559. After providing interest on debentures, bank charges, and a proportion of the cost of the 1930 Order, there remains a balance available for distribution of £4500. The Directors now recommend the payment of a final dividend of 8 p.ct. on the "original" shares and 6½ p.ct. on the "additional" shares, making for the whole year 14½ p.ct. per annum on the "original" shares, 11½ p.ct. per annum on the "additional" shares. This payment will absorb £1981, leaving to be carried forward to next year's account £2519. During the year under review the Glover-West vertical retorts and the Lancashire boilers were completed and put into operation and are giving every satisfaction. Owing to the increasing output of gas an additional 14 in. trunk main was laid from the Company's Works to Bideford Bridge so as to ensure the maintenance of an adequate supply of gas to all parts of the district. The sale of gas shows a satisfactory increase of 6·2 p.ct. over the previous year.

The Journal of the Fuel Society of Japan states that water gas manufacture was first started in Japan in 1901 when the Tokio Gas Company put two small plants in operation. To-day the same Company has altogether fourteen such plants at work with a daily output of about 13½ million c.ft. The Gas Company of Osaka has also six plants producing a daily total of 9 million c.ft.; the Gas Company of Kyoto has four plants turning out 2 million c.ft.; and the gas undertaking of Nagoya two plants with an output of 1 million c.ft. per day.

The Report of James Keith & Blackman Co., Ltd., for the year ended March 31 last, states that owing to the general depression in trade the amount of business done during the year was considerably less than that of the previous year. After providing for payment of preference dividend, and making sufficient allowance for depreciation and reserves against doubtful debts, the audited accounts show an available balance standing at the credit of the profit and loss account of £34,074. The Directors recommend that this sum be appropriated as follows: By the declaration of a dividend on the ordinary shares at the rate of 10 p.ct., less income-tax, absorbing £15,500; and by carrying forward to the current year the sum of £18,574.

The Pacific Pipe and Supply Company have recently published a leaflet covering the application of Papico Natural Gas Odorization Equipment. It is said that this type of equipment is used quite extensively to odorize the bulk of natural gas consumed in Southern California and many other districts. The principle upon which this mechanism operates utilizes differential pressures obtained across an orifice disc. The pressures thus obtained operate automatically to control the amount of odorant diffused into the gas transmission line. Several views of actual installations appear in the leaflet along with an interesting graph showing actual results obtained under various odorant concentrations. Copies may be obtained by writing to the Pacific Pipe and Supply Company, 1002, Santa Fe Avenue, Los Angeles, California.

Forthcoming Engagements.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

June 25.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting.

June 26.—WAVERLEY ASSOCIATION.—Annual Meeting in the Goold Hall, St. Andrew Square, Edinburgh.

June 30.—FEDERATION OF GAS EMPLOYERS.—Annual General Meeting at the Hotel Metropole, W.C. 2, 12.15 p.m.

June 30.—NATIONAL GAS COUNCIL.—Meeting of Central Executive Board, 11 a.m.; Annual General Meeting, 2.15 p.m., at the Hotel Metropole, W.C.2. Inspection of Watson House, 3 p.m.

July 3.—MANCHESTER DISTRICT INSTITUTION.—Ordinary General Meeting at Stretford. Inspection will be made of the Stretford Gas-Works.

Sept. 10.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual Meeting in Rothesay.

Sept. 16.—BRITISH COMMERCIAL GAS ASSOCIATION.—Meeting of General Committee at 28, Grosvenor Gardens, S.W. 1.

Sept. 28-30.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual Conference at Exeter.

Oct. 9.—NORTH OF ENGLAND ASSOCIATION.

Oct. 27-28.—INSTITUTION OF GAS ENGINEERS.—Autumnal Research Meeting.

THE NEWS—continued.

Street Lighting in Oldham.

The Annual Report of the Oldham Corporation Street Lighting Department, for the year ended March 25, 1931, shows that the Department is responsible for the lighting of 112 miles of roads and streets in the Borough. The gas installations comprise 72 1500-C.P. high-pressure gas lamps; 421 high-power low-pressure gas lamps; and 3551 low-pressure gas burners in ordinary lanterns. The number of hours which street lamps are lighted is 3800. The consumption of gas for the year ending December last was 72,023,000 c.ft., and the price was 2s. 10d. per 1000 c.ft., less 10 p.ct. discount.

During the past year the Department have improved the gas lighting of Abbeyhill's Road Bus Route, and have fixed, in lieu of the 2-light square lanterns, 4-light suspension gas lamps of the "Sugg" type, on swan neck fittings; automatic controllers have been fixed to reduce the consumption of gas after midnight. An increase in the lighting near the Waterhead Memorial was desirable, and a 10-light high-power low-pressure gas lamp of the "Sugg" type, with distant control device, attached to tramway standard, has been fixed. Near the car terminus, Waterhead, as an experiment, 3 12-light Bijou "strip" lanterns, made by Messrs. Foster & Pullen, Ltd., Bradford, have been fixed, a feature of this burner being that the mantles are all set in a straight line, instead of the usual cluster arrangement.

Education in Industry and Commerce.

Speaking at the thirteenth annual conference of the Association for Education in Industry and Commerce at the Great Central Hotel on June 17 (under the Presidency of the Rt. Hon. Lord Eustace Percy, P.C., M.P.), Sir David Milne-Watson, LL.D., D.L., Governor of the Gas Light and Coke Company, referred to a number of interesting points in this vital subject of education in industry and commerce made by various speakers in the course of the session.

Papers had been presented by Major Isidore Salmon, C.B.E., D.L., J.P., M.P. (Chairman of Messrs. J. Lyons & Co.); by Mr. R. Bell, C.B.E. (Assistant General Manager to the L.N.E.R.); and by Mr. A. P. M. Fleming, C.B.E. (of Messrs. Metropolitan Vickers Electrical Co., Ltd.); all the speakers dealing with the various methods of training employees adopted by their respective concerns.

Sir David Milne-Watson dealt with the question of examinations, particularly Matriculation, as a standard qualification demanded by many firms in the selecting of candidates for posts at the present day. It is not desirable to over-emphasize the value of examinations, said Sir David. But, on the other hand, he did consider that they formed a very important part of the training of men in business. To his mind, an examination was not necessarily a sole qualification, but was very good proof of the capacity to express correctly the knowledge that had been acquired. If a man was unable to do an examination question, it might be an indication of confused thinking. The industry with which he was connected, continued Sir David, was very largely a supply industry, and from time to time things went wrong in his Company, serving as it did between four and five million people. Many of their troubles, however, arose from the fact that a great many men could not give an accurate account of what had happened.

Unless a man could reach a certain standard he was very little use in business. He did not mean, on the other hand, that because a man was first class in examinations he was necessarily a first-class business man. One must always judge by personality in the long-run. He did not agree, however, that examinations were just waste of time.

Training of Salesmen.

Referring to the training of salesmen, Sir David said that this was regarded as a very important matter in his Company, and remarked that the Gas Industry had recently inaugurated an Education Scheme which would be of immense value to the Industry as a whole. They insisted that men should understand the technique of the business, know how to give a reasoned argument, and how to deal with consumers.

In the course of further remarks, Sir David said that whatever might be said about the skill of the British workman, in individual skill among the foreman class they were second to none in the world.

They in industry must be continually looking out for new business. As rationalization increased, so more and more people would be thrown out of work, and it was all the more necessary to find new industries to employ those thrown out of old ones. If one introduced mass-production, one must get new business; otherwise one was destroying industries.

Continuing, Sir David thought that most of those present had heard of what the Gas Light and Coke Company had done in regard to training, but he would mention one or two things which might be new to them. The Company had a most elaborate system of education, and they gave their apprentices opportunities during their working hours of attending lectures which were organized with the help of the London County Council Technical Institutes at Westminster and East Ham; they were in the habit of paying the fees of the boys attending classes.

The Gas Light and Coke Company, stated Sir David, had some thousand employees registered as students of the Institutes, which showed that they were availing themselves of the privilege offered. In regard to recreation, the Company had a hundred acres of playing fields and sports grounds, and in that way the Directors did their best to encourage employees to live an "all-round" life.

In conclusion, Sir David said he was perfectly certain that it was a good thing for business men such as themselves to come together and tell each other of their experiences; and this subject of education in industry and commerce was of the greatest importance to them at the present time.

Another Amalgamation.

The Gosport District Gas Company has entered into a provisional agreement to acquire the undertaking of the Bishop's Waltham Gas and Coke Company, and has applied to the Board of Trade for a Provisional Order authorizing the transfer. The Gosport Company purchased the business of the Fareham Gas and Coke Company in 1925, and now serves an area about 18 sq. miles, embracing half-a-dozen towns and villages with a population of over 50,000. Simultaneously with the vesting in it of the Bishop's Waltham concern, the Gosport Company seeks also to add to its area of supply another eight parishes.

The Gosport Company was formed in 1835, and has an authorized capital of £204,500, of which £148,900 is paid up. Since 1922 ordinary dividends have ranged over 6 and 7 p.ct. The Bishop's Waltham Company is likewise an old-established concern, dating from 1862, but is smaller than the Gosport. Its paid-up capital is only £2000. The main advantage of the acquisition to the Gosport Company is that it gives the latter the opportunity of a considerable expansion into adjacent and steadily developing territory. The purchase price is to be satisfied in consolidated ordinary stock.

Satisfactory Progress at Plymouth.

Increased sales and satisfactory progress generally were reported at the Annual General Meeting on June 17 of the Plymouth and Stonehouse Gas Light and Coke Company, when dividends were declared at the figures which have obtained for the past two years.

Mr. J. H. Ellis, Chairman of Directors, said that although the weather had been warmer throughout the past year than it was the year before—which was always a bad thing for gas companies—their sales of gas in Plymouth had increased, which in itself was highly satisfactory. The balance standing to the credit of the profit and loss account was £39,145, which permitted the maintenance of the dividends of the last two years—namely, 8 p.ct. on their ordinary stock, 13s. 6d. per share on the additional shares, and 13s. per share on the new shares.

Reviewing the accounts, the Chairman said the principal item on the debit side was £105,000 for coal and oil. This was not due to the increased price of coal, but because they had used more of it. Their coal had only cost them in the year under review three-halfpence per ton more than it did the year before, and in view of what had been going on in the way of legislation with regard to the coal trade that was not an unsatisfactory figure. They had used 8464 tons more than in the preceding year, which was due to the fact that their vertical retorts were undergoing repair, and they had to depend for a large part of the year upon their old and practically obsolete horizontal retorts.

The report of their Sales Department for the past year, continued Mr. Ellis, gave some interesting figures—not merely on the money side, but in many other ways they were steadily advancing. At the conclusion of their previous financial year their consumers were 41,534, and the figure at March last showed an increase of 617. The number of cookers had increased by 721 to a total of 37,723, and fires had increased by 3031. Thus on every working day of the year they were practically putting out two and a

half cookers per day and ten fires. Profit on sales of private fittings was £7465—an increase of £818, and coke £27,868, an increase of £8476. This very gratifying figure was due in part to the fact that they bought clean coal, partly to the care they took in grading their coke for the variety of uses to which it might be put, and to their improved sales organization.

In regard to the provision the Company was making for the growth of the demands upon it, Mr. Ellis said they were about to construct a 5 million c.ft. gasholder.

Alkali, &c., Works.

In our Editorial Columns this week we refer to several of the findings of the Chief Inspector of Alkali, &c., Works (Mr. W. A. Damon) in his Report for 1930 (H.M. Stationery Office, Adastral House, Kingsway, W.C. 2, price 9d. net).

The numbers of works registered in 1930 was 1042, which involved the inspection of 1911 separate processes. There was a reduction of 41 in the number of works, and of 64 in the number of separate processes. The following are the statistics for ammonia and tar in 1930:

Ammonia Products Manufactured.

Expressed as Sulphate (25¾ P.Ct. NH_3)—Tons.

From Liquor Produced in—	1930.	1929.	1928.
Gas-works	142,271	142,017	145,066
Other works, including coke ovens, iron works, producer gas, synthetic, &c.	566,960	698,466	404,450
Total	709,231	840,483	549,516

NOTE.—Of the total quantity of ammonia products, the equivalent of 51,662 tons was manufactured as concentrated ammoniacal liquor; the balance, 657,569 tons, consisted of other ammonia products (sulphate, chloride, nitrate, &c.).

Tar Treated.

Tar distilled	1,652,826 tons
Pitch produced	443,465 ,,

In regard to Scotland, Mr. J. W. Young gives the following figures:

—	Salts of Ammonia.	Tar Distilled.	Pitch Produced.
	Tons.	Tons.	Tons.
From gas-works	19,694	130,320	26,060
,, iron works	2,635	27,830	15,625
,, coke ovens	7,310	18,993	3,359
,, producer gas	2,360	4,883	2,283
,, shale works	35,860	..	..
Total 1930	67,859	182,026	47,327
,, 1929	71,776	203,578	61,708

The ammonia is expressed as pure sulphate: 1640 tons were obtained as concentrated liquor ammonia, and 184 tons as ammonium chloride.

These figures show that from the industrial sources—iron works, coke ovens, and producer gas—the yield of ammonia was less by 26 p.ct., and of tar by 15 p.ct.

A Satisfactory Substitute for Petrol.

An important development in the Chemical Works Section of the Belfast Gas Department is announced, plans being in readiness for the production from coal tar oil of a satisfactory substitute for petrol for use in internal combustion engines.

At the last meeting of the Belfast Gas Committee, the Engineer, Manager, and Secretary (Mr. J. D. Smith) reported that the research work had been successful in producing a fuel which had been tested by the Belfast Omnibus Company on their 'buses with very satisfactory results, and he anticipated that the production by the Department annually of approximately half-a-million gallons of this fuel would further increase the work and utility of the Chemical Works Section of the Undertaking, and at the same time facilitate all those industries in which mechanical transport is necessary, as this fuel could be produced at considerably less than the present price of petrol.

Mr. Smith paid high tribute to the valuable services in connection with the research rendered by Mr. Hugh H. Orr, M.I.Chem.E., Head of the Chemical Section of the Gas-Works, practically all the experiments being carried out after working hours, and also to the co-operation so willingly extended by the Belfast Omnibus Company. On test with the new fuel, a B.O.C. 'bus ran 12 miles to the gallon, as compared with 8 miles on a gallon of petrol, and no loss of engine power was experienced. It is claimed for the new fuel that engine knocking is eliminated and there is not any danger from fire from the fuel.

The Committee expressed their appreciation of the success of the experiments, and directed that their congratulations be conveyed to Mr. Orr. They also expressed their appreciation of the services rendered by the Belfast Omnibus Company. Mr. Smith intimated that he would report later relative to the fuel.

Gas Calculators.

In these days of keen competition, it has become an absolute necessity for business firms to furnish their clerical staff with up-to-date appliances so as to minimize labour and ensure accuracy. For many years past, Mr. F. H. Wakelin, Calculator Specialist, of 354, Wheeler Street, Birmingham, has devoted attention to the preparation of printed calculators for various trades and professions.

Included in the range are gas account calculators and gas conversion tables. The calculators for prices per 1000 c.ft. show, without a single addition, the exact amount to be charged for every meter reading from 100 to 50,900 c.ft., while larger readings are also calculated up to 10 million c.ft. The gas conversion tables are useful for converting meter readings to therms of a stated calorific value. Further useful calculations prepared by Mr. Wakelin are specially designed to facilitate work in making out gas accounts where therms are in use.

Exhibition at Kirbymoorside.

The Kirbymoorside Lighting Company (Yorks.) held a three days' Gas Exhibition on June 2, 3, and 4, which attracted a large and interested audience. At the opening ceremony, the Chairman of the Company (Mr. Thos. Leadley) introduced Mr. H. S. Valentine, the North-Eastern representative of Messrs. R. & A. Main, Ltd., who gave a short address on the antiquity and modernity of gas. He pleaded that, just as the ladies insisted upon appearing in modern dress, so gas should not be dressed in crinolines, but should be presented to the consumer in its modern dress. The exhibition was held for that purpose. As a proof of the hygienic excellence inherent in the use of gas, he instanced the 8 gas cookers and 38 gas fires known to be used by the 9 doctors who attended H.M. the King in his recent critical illness.

Miss Eccles, C.B.S., Diplomée Board of Education, then proceeded to give the first of her cookery demonstrations to an audience obviously interested and delighted. Around the hall was a fine display of gas cookers, fires, &c., by Messrs. R. & A. Main.

Change in Method of Charging for Gas at Lismore.

Notice has been given that until further notice gas supplied by the Lismore (Co. Waterford) Gas Company, instead of being charged by the 1000 c.ft. will be charged at per gas unit of 8 c.ft. containing 4000 B.Th.U.

The prices charged each collecting period as from July 1, 1931, will be in accordance with the following block system:

For the first	125	units or part thereof			1 penny per unit	
,, ,, next	125	,,	,,	,,	0·95	pence ,,
,, ,, ,,	125	,,	,,	,,	0·90	,, ,,
,, ,, ,,	125	,,	,,	,,	0·85	,, ,,
,, ,, ,,	125	,,	,,	,,	0·80	,, ,,
,, ,, ,,	125	,,	,,	,,	0·75	,, ,,
,, ,, ,,	125	,,	,,	,,	0·70	,, ,,
,, ,, ,,	125	,,	,,	,,	0·65	,, ,,
,, ,, ,,	125	,,	,,	,,	0·60	,, ,,
,, ,, ,,	125	,,	,,	,,	0·55	,, ,,
,, all over	1250	,,	,,	,,	one halfpenny	,,

Alternatively, consumers who so desire, may pay the same poundage upon their rateable value as required by the Electricity Supply Board and be charged at three farthings per unit. Consumers using a large quantity of gas in lowly rated premises would find this an advantageous alternative. Should the block system in any period work out cheaper than the rateable value system, the consumer will be given the benefit of the block system in such period.

Consumers through prepayment meters will be charged at same rates as ordinary consumers for gas and hires and cash received through meters will be placed to their credit,

NOTES ON NEW BOOKS

A BOOK TO READ.*

As our readers will be aware, next month the Society of Chemical Industry will celebrate its Jubilee, the dates arranged being July 13-19. In connection with this important occasion, Dr. Stephen Miall has written a book entitled "A History of the British Chemical Industry." Dr. Miall, who is Editor of "Chemistry and Industry," is peculiarly fitted for the task he has so well accomplished, not merely because of his close association with industrial chemistry, but because he has wide culture and a charming style. "A History of the British Chemical Industry" is definitely a book to read and enjoy.

In a foreword to the book Sir Harry McGowan, K.B.E., Chairman of I.C.I., speaks of the importance of the chemical industry. "As competition has grown," he observes, "and as new industries had to be created to meet the demands of a higher standard of living, industry in general has become more and more dependent on the chemist and engineer, until the chemical industry has become the very foundation on which not only British industry, but modern world industry, is erected." And in his Introduction the author suggests that a perusal of the book will satisfy most readers that we have had, and still have, our full share of outstanding discoveries and outstanding chemists. Our best works are as good as can be desired, and our other works are steadily being improved. We agree; and we believe with the author that, "notwithstanding present difficulties, there will be enormous advances, during the next twenty years, in the application of science to industry, and much of this advance will be due to chemists." This certainly applies to the Gas Industry, which is essentially a chemical engineering industry, though this fact is only partially realized at present, and was more or less ignored until after the war.

In turn the author deals with the heavy chemical industry; the dyestuffs industry; the fermentation industries; drugs and fine chemicals; the chemical industry of cellulose; metallurgy; gas, coke, and tar; the paint and varnish industry; and the soap industry. There are two other chapters—one headed "Miscellaneous," and the other concerned with chemists and chemical organizations. The field covered is indicative of the nature of the task set before Dr. Miall; yet, in spite of the extent of the field, the book has a nice balance. There is a good index, and each chapter is followed by a list of references or a chronological table, or by both. The volume is illustrated, mainly with portraits of leading chemists and chemical manufacturers, one of the portraits being that of Dr. Charles Carpenter, who was President of the Society of Chemical Industry in 1915-17.

Regarding the chapter on gas, coke, and tar, which extends to 23 pages, the author expresses his indebtedness to Mr. E. V. Evans, of the South Metropolitan Gas Company. In a general book such as this, those connected with any particular industry, though having their minds refreshed on that industry, will perhaps find the accounts of the development of other chemical industries of greater interest, for they will approach them less critically, and will gain a new point of view. Though the adage that familiarity breeds contempt cannot apply to the enthusiastic workers in any sphere of industry, the real value of a book like the one under notice must lie in its ability to foster interest in broader fields. This purpose is fulfilled admirably by "A History of British Chemical Industry." It is a fascinating story; and we should be surprised if anyone, having read it, could maintain that there is no romance in industry.

* "A History of the British Chemical Industry," by Stephen Miall, with a foreword by Sir Harry McGowan, K.B.E. Published by Ernest Benn Ltd.; price, 10s. 6d. net.

GAS ACCOUNTS.*

The first edition of "Gas Accounts," by Lawrence R. Dicksee, Emeritus Professor of Accountancy and Business Methods in the University of London, was published thirty years ago. The next edition was brought out in 1905, and this year we have a revised work. In the new edition attention is drawn to those provisions of the Gas Regulation Act, 1920, and the Gas Undertakings Act, 1929, which affect the accounts of gas undertakings, and mention is made of the improvements that may be effected by the introduction of office machinery of suitable type. In regard to mechanization, the author refers to an important development which has been rendered possible by the mechanization of gas accounts—the substitution of monthly for quarterly demand notes. This system was introduced by the South Metropolitan Gas Company two years ago, and has proved a great success.

"Gas Accounts" is an admirable work, and the price is well within the reach of all. Both author and publishers deserve the gratitude of the Gas Industry, which will doubtless not be slow to show practical recognition of the utility of the book.

* "The Accountants' Library," Vol. VII., "Gas Accounts," by Lawrence R. Dicksee, M.Com., F.C.A. Third Edition, 1931. Published by Gee & Co. (Publishers), Ltd; price 8s. net, 8s. 4d. post free.

THE WATER GAS PROCESS.*

Reviewed by "TAMBT."

The importance of water gas can be judged from the fact that in the last ten annual returns the quantity made by gas undertakings in Great Britain varied from 37 to 65 thousand million c.ft., reaching the maximum in the disastrous year of 1926. The characteristic property of water gas plant of being readily brought into operation at short notice enabled it to render yeoman service in keeping up the supply of gas when coal supplies ran short. In the last year, 1929, for which the Board of Trade Returns are available, 46·35 thousand million c.ft., or 14·5 p.ct. of the total gas made, was manufactured in water gas plants, and these figures are exclusive of gas of the same character made in other ways. The study before us, therefore, of the methods of ascertaining and evaluating with as great a degree of accuracy as possible every single item in the balances of carbon and of heat throughout the process is of the greatest interest. It reads like a detective story, and it constitutes a very fine piece of technological investigation.

The introduction sets out the several factors to be considered and gives a valulable résumé of the methods of arriving at the thermal data according to Travers, which, unfortunately, are given in Centigrade heat units per pound molecule. As these are neither British Thermal Units nor calories, we had to transpose them before we could appreciate the figures. A reflection, by-the-way, is that it is time we in Britain got down to the inevitable change-over to the metric system; could we not use this time of slackness in industry for a necessary measure which could not fail to benefit us in the foreign markets?

The paper proceeds to a description of methods and some results obtained in the direct measurement of the smaller factors entering into the problem; and we find that the carbon lost in the form of dust projected from the chimney stack may be as much as 1 p.ct. of the total carbon supplied to the generator; that consumed in the generator during the clinkering operation may be nearly as much; that consumed in the hot clinker itself between removal and cooling is only of the order of 0·05 p.ct.; while that remaining in the clinker and ashes is about 6 p.ct.

In the finished carbon balance-sheet we find that almost exactly as much carbon is consumed during the blow period as is left in the water gas produced. In other words, 45 p.ct. of the carbon in the coke fed to the generator is recovered as water gas, an equal proportion is consumed in the blow or heating-up process, while about 10 p.ct. is dissipated in waste of various kinds; and these figures are ascertained with an error which does not exceed 2·2 p.ct. on the whole balance.

In view of this, it is rather disappointing to realize that this 2·2 p.ct. represents 443·5 lbs. of carbon lost in the balance, while the three items C4 (carbon in dust in stack trunk), C5 (carbon in dust projected from stack), and C6 (carbon lost during clinkering), over the measurement of which so much care has been expended, total about the same amount—446·5 lbs.

The calculation of the thermal balance involves considerably more assumption, and the difference figure (for errors, &c.) is given as 3·3 p.ct. of the thermal value of the coke supplied to the generator; this difference figure is finally accounted for approximately by taking into consideration losses by radiation, &c., from the surface of the generator, and heat lost as heat of reaction and sensible heat of the gases issuing from the generator during clinkering operations. We are not clear, however, as to why the 10·00 therms lost per ton of dry coal (see p. 29) is divided by

* "The Water Gas Process: A Study of the Carbon and Thermal Balances." Department of Scientific and Industrial Research. Fuel Research, Technical Paper No 30. London: H.M. Stationery Office, Adastral House, Kingsway, W.C. 2; 1931; pp. VI. + 31; price, 9d. net.

about 390 (the thermal value per ton of coke) to give the above 3·3 p.ct., instead of by 200, the total of the items (per ton of coke) tabulated to give the thermal balance on which this difference figure should surely be calculated.

In the same Table (p. 29) the conversion of the items in the thermal balance from "Therms for clinkering period 3" to "Therms per ton of dry coke" has been effected, for no obvious reason, by dividing in each case by 2·57 instead of by 2·95, the equivalent in tons of the 6614·5 lb. of coke used in the test.

On the whole it is unfortunate that the report of so excellent a piece of work as that described should show a considerable number of errors and inconsistencies. The subject-matter is so important and the source so authoritative that no reticence need be felt in drawing attention to these discrepancies, so as to avoid, if possible, having them re-quoted in future.

In Table 2 (pp. 4 and 5) it is distinctly jarring and surely mathematically unsound to see calorific value figures given to the nearest unit (12,883) in the same column with a 13,000 and a 12,800; while the averages in the last column are just as inconsistent, showing, *e.g.*, a 14,436 and a 14,500.

On p. 7, the figures 38 and 23 are bracketed together and added up to 51 (in Table 4).

The figure CO (carbon supplied to generator) is worked out on p. 16 to 20,091 lbs., and is quoted again on p. 21 as 20,090·0.

On page 27, line 4, 105 should read 510 and on line 27 "periods 2-13," by reference to Table 15 on the opposite page, should be "periods 1-13."

ON THE ELECTRICAL SIDE

Views on the Weir Report.

Some weeks have elapsed since the publication of the report of the Committee on Main Line Railway Electrification (known as the "Weir Report," because Lord Weir acted as Chairman), and interest in it seems to have to a large extent died down. The Committee were appointed to examine the economic and other aspects of electrification of the railway systems in Great Britain, and in their report they state that the electrification of the main line system would involve an expenditure of £261,000,000, with another £45,000,000 if the suburban system were included. If (as is recommended) the Central Electricity Board supplied the whole of the current required, this would entail an expenditure on the part of the Board of £80,000,000. Even should interest be forthcoming, these are big sums; and while the cost is certain, the advantages must to some extent remain problematical until the work is completed. The report, however, points out that, considering the vast annual expenditure on roads which promote increased road haulage, which is in direct competition with the railways, and which cannot be directly remunerative, the mere magnitude of the sum involved in electrification should be no deterrent to the earnest consideration of the electrification proposals, bearing in mind their economic and social merits.

The benefits that may accrue from the railway point of view are only one part of the story; there is another side which has nothing whatever to do with travel. We refer to the hope that this additional, and enormous, load for the Electricity Board would result in cheaper electricity for the general public, and in an acceleration of rural electricity. This might have a lot to do with enthusiasm for the report in some quarters, but, as Lord Banbury (late Chairman of the Great Northern Railway) rightly points out in a letter to "The Times," there is no reason why railway shareholders, whose property has already suffered severe depreciation should spend money which might entail still further depreciation in order to accelerate electrification, "which is not making the progress that the supporters of the Act of 1926 prophesied." He shows how difficult it would be for the Companies to raise the huge amount of capital required, and how narrow would be the margin between the interest payments and the anticipated savings, and, while admitting certain advantages on the suburban system, asks, with regard to the main lines: "Will any manufacturer or colliery proprietor send more traffic on the railway because it is hauled by electricity? It does not matter to him how his goods are hauled. Will people give up travelling by motors because they can go in a train drawn by electricity instead of steam? I see no reason to suppose that electrification of the main lines will bring any increase of traffic. How then will the interest on the increased capital be found? The Committee estimate that the savings will amount to £17,500,000, of which £10,747,000 consists of wages saved by the dismissal of drivers, stokers, and guards, thus creating further unemployment. If the railways were now being built, it might be well to consider electrification, but to spend vast sums now on electrification will still further depreciate railway securities and render recovery impossible."

Thus it will be seen that there is evidently more than one side to this question, and in considering the Weir Report it must be remembered that what is sauce for the Central Electricity Board is by no means necessarily sauce for the unfortunate railway shareholder.

A Halfpenny per Unit Excessive.

Another interesting view of the Weir Report has been presented by a Railway Electrical Engineer in the pages of the "Electrician." According to this writer, "there is too much evidence of an ardent desire to help the grid, and, incidentally, the general power user. Quite frankly, this will not do—for the railway man. Throughout the report the railway interests represent only a minor third. It may seem heresy for an electrical man to say so, but in any re-organization of the railways as regards either traction or management, railway interests must constitute a major first. On no other terms should a change of tractive methods be considered. It is proposed to standardize the supply to the railways by supplying them from the grid at ½d. per unit! There is to be no alternative supply to compete and indicate whether the grid charge is reasonable or excessive, and presumably, when the scheme is put into force, no railway will be permitted to discard the grid supply and use Diesel-electric locomotives, or generate its own power. They will all, in fact, have to take exactly what the grid sends them. Now ½d. per unit is an extortionate price to ask a main line railway to pay for its electrical energy. . . . If the railways are to be made to purchase energy from the grid, it ought to be at no higher price than 0·33d. per unit, or even less. In addition, the grid must not be the sole supplier. The railways must be permitted to have at least three independent capital stations, laid out to their own requirements, worked to serve the railway interest first and foremost. When taking a supply from the grid, they must be permitted to do so to suit their convenience, and not that of the grid. Only under such conditions will railway interests be safe from exploitation by a national supply system tremulously anxious to supply cheap electricity to everybody and balance its accounts favourably at the year end."

In short, Railway Electrical Engineer makes it quite clear that, judging the matter from the railway point of view, it would be altogether wrong to put the railways "on the grid."

Gas and Electricity for Street Lighting.

The Incorporated Municipal Electrical Association have been holding their convention at Scarborough, and among the readers of papers was Mr. C. W. Sully, Director of E.L.M.A. Mr. Sully dealt with the value of the lighting load, and included some interesting statistics with regard to street lighting, compiled from replies to a questionnaire which were received from 196 authorized undertakings throughout Great Britain. The following is an extract from his paper:

Number of Authorities.	Proportion of Electric to Gas Street Lighting Standards.
12	*Nil*
45	Up to 25 p.ct.
22	Over 25 ,, and under 50 p.ct.
29	,, 50 ,, ,, ,, 75 ,,
44	,, 75 ,, ,, ,, 100 ,,
44	,, 100 ,,

The total number of street lighting standards within the areas of these 196 authorities is 446,000, of which 178,000, or 40 p.ct., were electrically lighted. It has recently been estimated that the total number of standards throughout Great Britain is 670,000, and on that basis the above analysis deals with not less than two-thirds of the standards used throughout the country. If 10 p.ct. of the remaining 224,000 standards are electrically lighted, then there are to-day some 470,000 street lighting standards yet to be converted from gas to electricity. The standard of lighting to-day is by no means satisfactory in the light of modern demands, and varies to such an extent that it frequently becomes a danger rather than an assistance to the motoring public in particular.

EXTENSIONS AT - SALTCOATS -

Inauguration of "W-D" Continuous Vertical Retorts

Wednesday last marked the inauguration of a recently-installed Woodall-Duckham continuous vertical retort plant at the works of the Saltcoats Gas Company.

After the company had assembled at the works, Mr. JAMES BARBOUR, the Engineer and Manager, extended a hearty welcome to all, and asked Mrs. JOHN M. ORR (wife of the Chairman of the Company) formally to inaugurate the plant by charging a retort. Before doing so, Mrs. Orr said she had much pleasure in performing the ceremony, and expressed the hope that the new plant would be a success, from the point of view both of the Gas Company and of the consumers.

Sir ARTHUR DUCKHAM, K.C.B., G.B.E., who was then called upon, said he was very proud of this installation. The system provided a very easy and comfortable way of making gas, and the community in general also benefited, because it lessened the smoke nuisance considerably. He then presented to Mrs. Orr a handsome rose bowl as a souvenir of the occasion.

Mrs. ORR briefly returned thanks for the gift.

Mr. ORR said he desired at this stage to place on record the pleasant relationships which had existed between the contractors and the Company. When the Directors met Mr. Beale, of the Woodall-Duckham Company, he (Mr. Orr) was inclined to question Mr. Beale's claims as to what the plant would do. He now desired to erase these query marks, and say that every claim which Mr. Beale had put forward had been substantiated. He could assure any gas company or burgh owning gas-works that, if they wished any work done by the Woodall-Duckham Company, they would get the work well done.

Mr. BEALE said Mr. Orr had referred to the early negotiations, and he thanked him on behalf of the firm for his expression of appreciation of their work.

Sir ARTHUR DUCKHAM said he had just come back from Canada and U.S.A., and he was pleased to say that his Company had never been busier than they were at present. They had booked more orders last year than at any other time in their history.

Gas was first supplied to the town of Saltcoats in 1837. In 1871, the make of the Saltcoats Gas Company was 3,273,600 c.ft. By 1921 the make had grown to over 48 millions, 1½ millions being sold for public lighting. Last year the respective figures were 64 millions and 4¾ millions.

THE NEW INSTALLATION.

The Woodall-Duckham installation consists of one bench containing four retorts, heated by means of two producers placed at the retort house floor level at one end of the bench. It is capable of carbonizing 22·4 tons of coal a day, and of producing 448,000 c.ft. of gas of calorific value 430 B.Th.U. per c.ft.

Small coal of a size not larger than 3½ in. cube is discharged into a reinforced concrete receiving hopper, from which it is loaded into a specially designed side discharging skip. This skip is run into a 25 cwt. steam driven lift at the ground level, or at a depth of 2 ft. 6 in. below the retort house floor level, and elevated to the level of the overhead storage hopper above the retort bench. At this level a platform is provided along which the skip is run, and the coal is discharged into the overhead storage hopper. Each retort is about 25 ft. high and of rectangular tapered shape, being 53 in. by 10 in. at the top, and so designed as to allow continuous regular movement of the charge through the retort.

THE RETORT BENCH.

The design of the setting is in accordance with the latest practice of the Woodall-Duckham system, special features being as follows:

(1) Each retort is absolutely separate from the next. A straight joint is built between the retorts so that any expansion may be taken up, and provision is made so that any individual retort can be heated up or cooled down without in any way affecting the other retorts. Each retort is provided with its own producer gas, secondary air, and waste gas flue dampers. It is thus a separate heating unit. By this arrangement maximum flexibility in output is obtained.

(2) The report faces and combustion chambers are constructed of the highest quality silica material for the full depth of the combustion chambers. This ensures low maintenance costs coupled with high output per retort.

(3) In order to provide means of varying the relation between the temperatures at the top and the bottom of the retort, arrangements are made for the introduction of additional secondary air at a second point in the combustion chamber. It is thus possible to vary the zoning of the heat according to the type of coal to be carbonized and the calorific value of the gas to be made.

(4) Both the side walls and the top of the bench are heavily insulated, with the double object of improving the working conditions and saving fuel.

Each producer is large enough to supply the gas for heating two retorts. The arrangement is such that one producer may be shut down without interfering in any way with the working of the other producer. The gas from either of the producers may be taken to the heating flues of any of the retorts. The producers are of the step-grate type and are constructed with ample grate area.

The contents of the coke chambers below the retorts are discharged into one of the two side discharging skips running on rails on the floor of the retort house. For dealing with the coke required for the producers, the skip is run into the lift and elevated to the producer charging platform. At this level it is run out of the lift on to a cast-iron platform set in the top of the producer brickwork, and the coke is discharged direct into the charging holes of the producers. For dealing with the surplus coke the skip is taken through the end of the retort house into the coke yard, and the coke is discharged into open storage in the yard as required.

Steam engine drives are supplied for operating the 25 cwt. lift, the coke extractor gear, and the liquor circulating pumps.

LUNCHEON SPEECHES.

After the ceremony at the works, those present proceeded to the Lesser Town Hall, where lunch was served. Following the Loyal Toast,

The CHAIRMAN (Mr. J. M. Orr) proposed the toast of "The Gas Industry." He said that, as a Company, they had not undertaken the capital expenditure on the new plant simply for the sake of securing dividends. Their main effort of accomplishment would be realized when they could manufacture and distribute an efficient supply of high-quality gas which would conduce to its consumption at a cost much less than at present. By developing and popularizing the use of gas for both domestic and public purposes, they were helping not only to solve the problem of smoke abatement, but to improve the condition of the mining industry.

GAS FOR PUBLIC LIGHTING.

On this question, Mr. Orr said: "We are broad-minded enough to recognize that there is a large field of usefulness for both gas and electricity. There is one question which you hear discussed very often—namely, whether light from electricity or light from gas is the best for public lighting. I will briefly give you a little experience of my own. As you are doubtless all aware, within the Metropolitan area there are a number of boroughs having their own representative Councils, with the usual functions of Borough Councils to discharge. So, starting out late one night I got into touch with a superintendent of police of the Westminster Borough. He knew nothing whatever about me or my opinions; and when I asked him which he preferred, gas or electric light for public lighting, he answered without hesitation, Gas. As we were going along Victoria Street he remarked that there was no better light in London than this, the street being lighted by gas. He asked me to accompany him along to the crossing close to Victoria Station, when he would see what the officer who had charge of the traffic there said. I did so, and the superintendent put a direct question to him as to which light he preferred, and the answer came as direct—Gas. . . . Saltcoats is well lighted. Still, I would hazard the opinion that a closer co-operation between

the Lighting Committee of the Town Council and the Company might with benefit be tried."

Courageous Enterprise.

Sir Arthur Duckham, in replying, said that gas and electricity were complementary. They welcomed electricity as a power; that was its proper place. Many householders found electricity more convenient as a light, but to people to whom every penny was important, gas would always appeal. The greatest proof they had of the success of the Gas Industry was the fact that it was going ahead. He had visited many large cities abroad, including New York, and found that the increase in gas consumption in these cities had been greater than ever in recent years. He congratulated the Directors of the Saltcoats Gas Company in being courageous enough to take steps to put in the new plant. This was really a big step for such a small Company.

A Good Record.

Mr. T. Scott (a Director of the Company) proposed "The Provost, Magistrates, and Councillors of the Burgh of Saltcoats." He referred to the dealings between the Gas Company and the Town Council, and said that a conference was arranged some time ago between the Directors of the Company and the Committee of the Town Council in regard to street lighing. Unfortunately, owing to the Provost's illness, this conference had to be postponed, and later it had again to be put off. They were hopeful that an opportunity would arise soon to hold this conference, as the Directors were desirous to co-operate with the Town Council in this matter. Regarding the Gas Company, Mr. Scott said it was 100 years since the local Company started, and they had never "let the town down" as regards gas supply.

Provost J. Christie thanked Mr. Scott for his remarks. He congratulated the Gas Company on the progressive step they had taken, and hoped that success would attend it. He was sure that Saltcoats was not suffering through the Town Council not possessing the gas-works; and he assured the Directors that the members of the Council would do everything they could to co-operate with them.

Mr. R. Bryce Orr (a Director of the Company), in proposing "Our Guests," referred to the encouragement and valuable help which the Directors had received from officials of other works such as Barrhead, Denny, Alva, and Crieff, and also to the loyal co-operation and help received from the Managers of the Ardrossan and Stevenston Gas-Works. Regarding the new plant at the Saltcoats Works, he said their Manager had informed the Directors that they had made progress even in the short time since the plant was installed.

Mr. G. C. Guthrie (Ardrossan), in replying, said that the Saltcoats Gas Company had always kept abreast of the times.

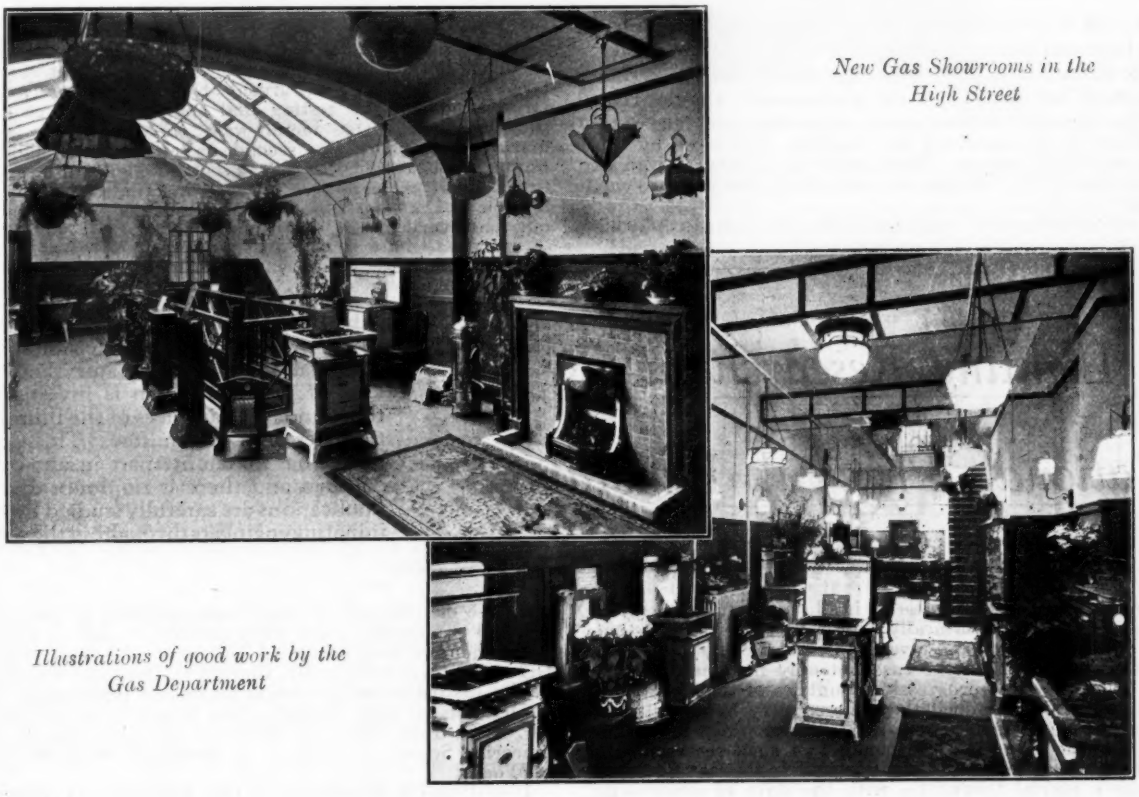
Mr. D. R. Bryden (a Director of the Company) proposed "The Officials."

Mr. J. Campbell (Joint Secretary), in replying, said this was really Mr. Barbour's day, as he was mainly responsible for the excellent progress made in the works and for the installation of the new plant.

Mr. A. K. Young (a Director of the Company), in proposing "The Chairman," said that Mr. Orr became a member of the Directorate in 1917, and was appointed Chairman in 1927, and much of the progress made was due to the valuable services he had rendered.

The Chairman briefly returned thanks, and this terminated the proceedings.

Stockton Corporation's Enterprise



New Gas Showrooms in the High Street

Illustrations of good work by the Gas Department

On June 8 the Mayor of Stockton (Alderman F. T. Nattrass) formally declared open new showrooms of the Stockton Gas Department in High Street, Stockton. The premises are of an elegant character. There are three storeys, and oak staircases lead to each. Councillor J. Stoddart, Chairman of the Gas Committee, presided, and the Mayor congratulated the Committee upon their enterprise. The plans of the new showrooms were prepared by the Gas Department with the exception of the shop front and staircases, which were by the Borough Engineer (Mr. J. P. Wakeford). The work of reconstruction, including the steel-framed structure, has been carried out by the Department by direct labour under the supervision of the Gas Engineer (Mr. W. W. Atley).

A comprehensive range of the latest and most up-to-date gas appliances for cooking, heating, and lighting is displayed on each floor. The building is centrally heated by means of a "B.T.U." gas heated boiler, which is connected to radiators on each floor.

GAS AT DUDLEY - TRADES EXHIBITION

An interesting stand was arranged by the Town of Dudley Gas Light Company at a Trades Exhibition held during Whit Week

As will be seen from the accompanying photograph, the left hand end of the stand was devoted to a cooker display, while in the centre there was a gas fire setting and certain radiators, not obvious in the photograph. On the right of the domestic section was a large range of hot water appliances, all connected and working, and close by was the industrial section, which included a natural-draught low-pressure gas furnace, in operation, and a fish-frying range.

Two special points emphasized by the Company during the Exhibition were switch control for gas lighting and cost. In regard to the matter of cost of gas, on the back of the stand there were three ordinary gas meters with large dials. These were arranged by the Company with large hands on the testing dial spindle, the large dials showing 5 c.ft. One meter was connected to an automatic gas cooker, the second to an inverted lighting burner, and the third to a " Sunhot " boiler—all in operation. There were notices on each installation calling attention to the long time that 1 c.ft. lasted, and pointing out that every 22 c.ft. cost only one penny.

Lighting Research at the National Physical Laboratory

A brief sketch showing the nature of the work in the Photometry Division of the National Physical Laboratory and the kind of problem which is investigated there under the auspices of the Illumination Research Committee. This Committee has no counterpart in any other country, and there is no doubt that its publications are carefully studied by illuminating engineers throughout the world

By JOHN W. T. WALSH, M.A., D.Sc.

The recent growth of interest in illumination problems of all kinds has not unnaturally been reflected in a persistent demand for research and investigation along many different lines. This has been the case not only in Great Britain, but in all the most progressive countries of the world; but it may be fairly claimed that this country has been more fortunate than any other in the facilities which are available for the initiation and conduct of such research. In 1923 the Department of Scientific and Industrial Research set up a special Committee with the duty of supervising researches on specific lighting problems suggested either by Government Departments, by industrial organizations, or by anyone interested in the subject.

It was realized at the outset that lighting was not a matter of pure engineering, but that the physiological and psychological aspects of the subject must receive very careful consideration. For this reason the Illumination Research Committee was instructed to keep in the closest possible touch with the Medical Research Council, and that body appoints two members on the Committee.* The importance of securing adequate representation of the architectural profession is also fully realized,† and, of course, both the gas and electrical interests are represented.‡ Other members include Mr. Clifford C. Paterson, President of the Institution of Electrical Engineers (Chairman), Mr. D. R. Wilson, H.M. Deputy Chief Inspector of Factories, Mr. J. S. Dow, Hon. Secretary of the Illuminating Engineering Society, and Mr. J. A. Macintyre of H.M. Office of Works.

It will readily be understood that with such a Committee working actively in the matter, lighting research in this country has progressed at a remarkable rate. Much of the work (though by no means all) is carried out in the Photometry Section of the National Physical Laboratory at Teddington. This Section, as its name implies, was originally set up for the purpose of carrying out photometric work pure and simple. It looked after the international unit of candle-power as far as Great Britain was concerned, it measured light sources sent in by manufacturers or users,

* These members are at present Sir John H. Parsons, C.B.E., F.R.S., and Prof. H. Hamilton Hartridge, F.R.S.

† The architects on the Committee are Sir Frank Baines, K.C.V.O., and Dr. Raymond Unwin, President R.I.B.A.

‡ Mr. J. G. Clark is a member of the Committee.

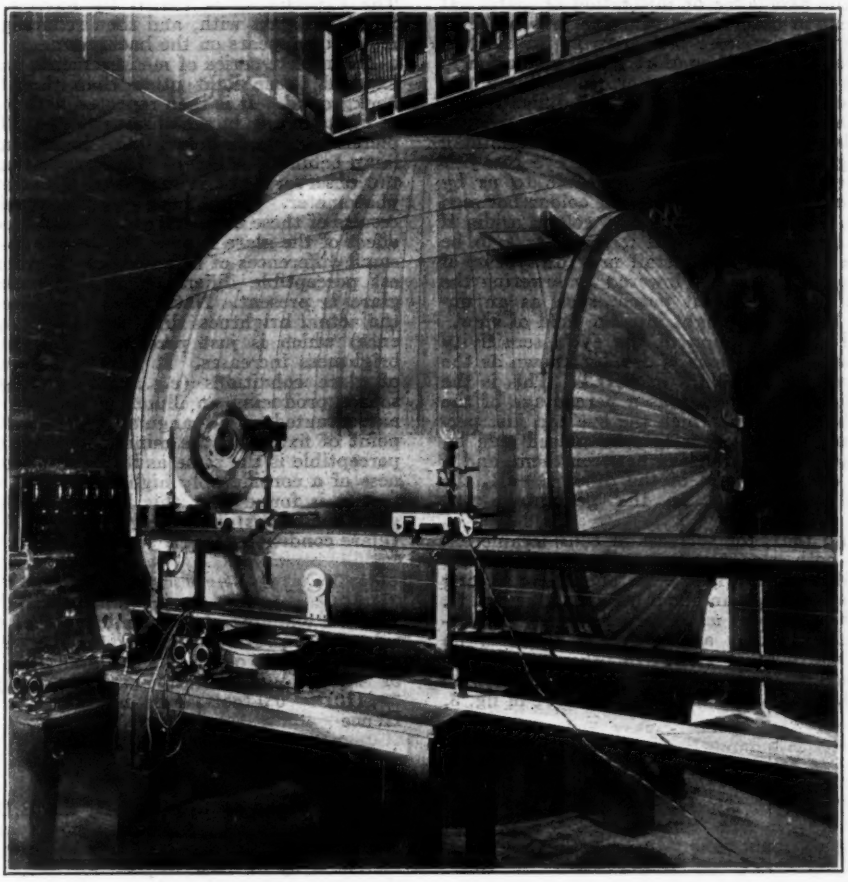


FIG. 1.—THE 10-FT. INTEGRATING SPHERE AT THE NATIONAL PHYSICAL LABORATORY.

it standardized lamps for use as sub-standards in other laboratories, and it carried out " life-tests " on lamps and prepared polar curves of light distribution from light sources and fittings. All this work it still continues to do, and, in fact, the volume of work of this kind has shown a steady, if slow, growth year by year. Modern developments have necessitated the installation of new apparatus, and one imposing piece of equipment now available for measuring the total light output of large lamps or fittings is the 10-ft. integrating sphere shown in fig. 1. This sphere is believed to be the largest spherical photometric integrator in the world, and many types of lighting equipment have been measured in it.

The application of the photo-electric cell to photometric measurements has been carefully investigated for the last few years; and it is hoped that before long this method of measuring the light output of lamps of all kinds will be in regular use. In addition to the greater accuracy and convenience of photo-electric photometry, this method possesses the unique advantage that by its means a continuous record may be obtained of the candle-power fluctuations of any variable source of light. For instance, if a cell be exposed to daylight, the current passing through it may be caused to deflect a galvanometer spot which falls on a rotating drum of photographic paper. In this way a curve is obtained to show how the illumination varies throughout the day. Such a curve is shown in fig. 2. The rapidity with which quite large variations occur, even on days which would probably be regarded as very " steady," is surprising.

This is one example of the way in which photometric apparatus and methods have been modified and adapted to meet the needs of illumination research. Another is the development of several types of portable illumination photometers. This work had to be undertaken at the Laboratory because there was no portable photometer already available which would give the accuracy needed in some of the research problems which had to be dealt with. Gain in accuracy has necessarily led to a not inconsiderable increase of weight and bulk and a consequent sacrifice in portability, but this must be faced when an accuracy of (say) 2 to 3 p.ct. is necessary in the measurements to be made.

The development of the research work done under the auspices of the Illumination Research Committee has naturally necessitated a considerable expansion of the Photometry Section of the Laboratory, and in fact this Section might now be more appropriately termed the Section of Photometry and Illumination.

The research done necessarily covers all phases of lighting, but it may be broadly divided into " daylight " re-

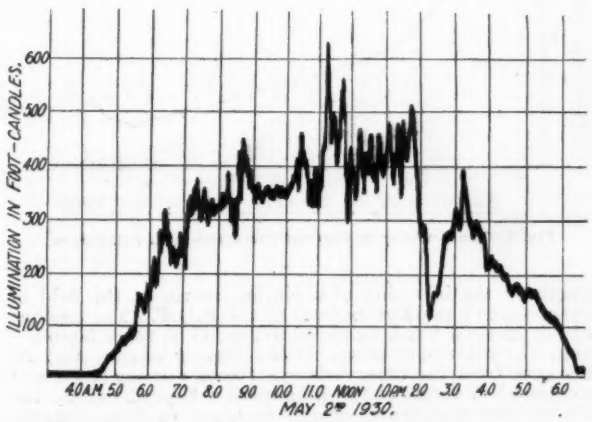


Fig. 2.—Photo-Electric Record of Daylight.

search and " artificial lighting " research. In the latter, the particular form of illumination is frequently quite unimportant; the problem is one of the relation of candle-power, illumination, or brightness to the ability to carry out some visual task, quite irrespective of the nature of the source providing the light. Sometimes it is the property of a material, as regards its influence on the light reaching it, which is the object of the investigation. This will be seen quite clearly from the examples of researches described in what follows immediately.

Research on Glare.

Perhaps one of the most persistently intrusive factors in any problem with which an illuminating engineer may be

called to deal is the avoidance or mitigation of glare. It is a matter of common observation that the presence of a source of light of high intrinsic brilliancy in the field of view causes both a sense of discomfort and a reduction in the ability to see fine detail. The former of these two effects, the sense of discomfort, is extremely difficult, perhaps impossible, to evaluate. The latter may, however, be measured (possibly somewhat arbitrarily) by determining the degree of brightness contrast which the eye can *just* perceive. The detail of a material is visible to us by reason of the difference of brightness or of colour between the various parts. Leaving difference of colour aside, if the difference of brightness be small it may cease to be perceptible to the eye (*i.e.*, the detail may disappear) if the general level of brightness be lowered by lowering the illumination, *or* if a very bright patch, such as an unshielded source of light, be brought into the field of view.

The figure used as a criterion of the eye's sensitivity under any given set of conditions is usually known as the "brightness difference threshold," or B.D.T. This is the difference of brightness, expressed as a percentage of the lower of the two brightnesses, which the eye can just perceive as a difference. If two surfaces be placed side by side without any noticeable boundary between them, and if the brightness of one be B and of the other B+dB, the contrast is usually expressed as the percentage 100 (dB/B).

It has been found that, for surfaces of considerable extent, viewed with both eyes, the two surfaces will appear unequally bright if 100 (dB/B) exceeds about *one* so long as the value of B is not less than about 0·1 candle per sq. ft. (the brightness of a piece of *white* paper having an illumination of 0·4 foot-candle) and provided there is no glaring source in the field of view. In other words, the B.D.T. for these conditions is about 1 p.ct. As the value of B falls, the B.D.T. rises, as shown by the curve of fig. 3.

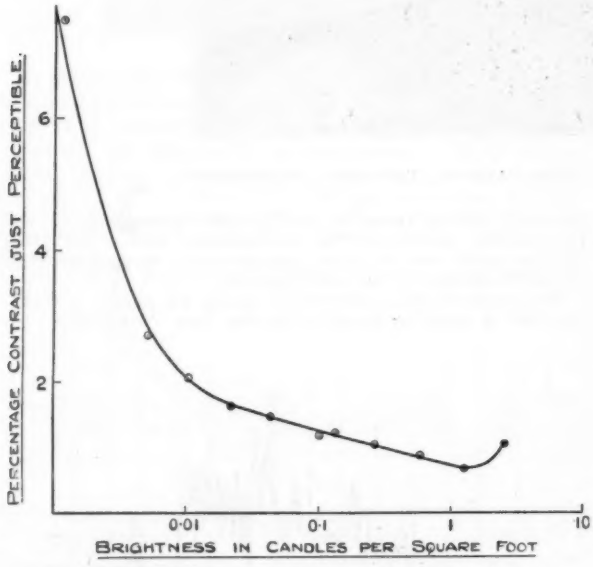


Fig. 3.—The Variation of Contrast Perception with Brightness.

Similarly the intrusion of a glaring source in the field of view causes a marked increase in the B.D.T. The amount of this increase has been found to depend on three factors—viz., (i.) the candle-power of the glaring source, (ii.) its distance from the observer's eye (these are combined and expressed in terms of the illumination E produced by the glaring source at the observer's eye), and (iii.) the distance of the glaring source from the object being looked at (this is expressed in terms of θ, the angle subtended at the observer's eye by the line joining the object and the glaring source).

The subject has been investigated by projecting on to a white screen, by means of a modified magic lantern arrangement, a small circular patch of light of readily variable intensity. The brightness of the white screen is adjusted to some desired value B, and the brightness of the circular patch is equal to this brightness increased by the brightness due to the projected light. The latter is gradually raised from zero until the patch can just be discerned by the observer. The value of this additional brightness, dB, is then noted, and the B.D.T. for that experiment is 100B/(B+dB). Of course, the experiment is repeated many times and for different observers, so as to obtain values representative of an average visual performance. The experiment is varied by having the patch clearly visible to start with, and then reducing its intensity until it just disappears on the background.

A complete series of measurements is made with the eye exposed to no light other than that from the extended background. It is then repeated with a small bright patch of light shining in the observer's eye. This is arranged by piercing a small hole in the background and placing a lamp behind this hole. The illumination thus produced at the observer's eye is measured by means of an auxiliary photometer. It has been found convenient to express the results of these experiments by the following method. The effect of the glare is to cause the eye to be less sensitive to small differences of brightness. In other words, the smallest perceptible difference of brightness is greater when glare is present. Naturally, even when glare is absent, the actual brightness difference (*not* the percentage difference) which is just perceptible increases as the general brightness increases. It follows that with any given set of glare conditions (*e.g.*, general brightness B, glaring source producing an illumination E at the observer's eye and situated at an angular distance θ degrees from the point of fixation), the minimum brightness difference just perceptible is the same as it would be for a general brightness of a considerably higher level but with no glare. In fact it is found that this higher brightness level B^1 (no-glare conditions) is related to the actual brightness level B (glare conditions) by the equation*

$$B^1 = B + 4{\cdot}16\ E/\theta^{1{\cdot}5}$$

As an example of the significance of this equation, consider a lamp of 30 candle-power situated at a distance of 10 ft. from the observer's eye and at an angle of elevation of 4°. The illumination at the observer's eye, E, is $30/(10)^2 = 0{\cdot}3$ foot-candle and $\theta = 4$.
Hence

$$B^1 = B + 4{\cdot}16 \times 0{\cdot}3/8$$
$$= B + 0{\cdot}16$$

Since at ordinary values of B, the B.D.T. (*i.e.*, the *percentage* difference of brightness) is approximately constant, this shows that the eye requires a contrast to be increased by at least 16 p.ct. for it to be as visible under the glare conditions.

In a recent number of the "JOURNAL" it was shown how the results of the work just described could be applied to the case of a street lighting system, and how it was possible to deduce certain general principles which ought to be followed in order that the sensitivity of the eyes of road users should be reduced as little as possible by their inevitable exposure to the light from the street lamps. For the purpose of carrying out small-scale street lighting experiments, one of the internal communication roads at the N.P.L. has been fitted with a system of posts and overhead wires, so that lighting fittings may be hung at any desired height, spacing, and position with respect to the edges of the road. This experimental road proved very useful in making preliminary trials preparatory to the full-scale experiments carried out (in collaboration with the Association of Public Lighting Engineers) at Sheffield in 1928 and at Leicester in 1930. The former piece of work was described in the "Illuminating Engineer" for August and September, 1929; the report on the Leicester experiments has not yet been published.

Work is at present in progress on two problems which are akin to that described above, but in which the conditions are more complex. There is first the effect of the colour of the glaring source, and this is being actively studied with a specially designed piece of apparatus. Secondly there is what may be called the "time-effect" in glare. It is well-known that the approach of a powerful motor car headlight causes a reduction in the sensitivity of the eye, and that the original sensitivity is only regained comparatively slowly. It is of interest, and probably also of considerable practical importance, to measure the rate of decrease of the B.D.T. due to the sudden onset of glare, and the rate of recovery after the glaring source has been removed. This subject also is being carefully investigated, but, as has been indicated, such experiments involve very large numbers of measurements and consequently extend over a considerable period of time.

THE BRIGHTNESS OF DIFFUSING GLASSWARE.

Some of the researches undertaken by the Illumination Research Committee have been suggested by the British Engineering Standards Association. When a new Standard Specification is in preparation it not infrequently happens that, in order to ensure that some particular figure in the

* "The Effect of Glare on the Brightness Difference Threshold," W. S. Stiles, Illn. Research Technical Paper No. 8. H.M. Stationery Office. P. 41.

specification shall be representative of good practice, a careful investigation of existing conditions is required. For instance, in specifying a maximum brightness for the surface of diffusing glassware fittings it is necessary that the figure inserted in the specification shall be one that can be worked to by manufacturers and, on the other hand, one that illuminating engineers can accept as satisfactory both from the point of view of efficiency and with due regard to the necessity for reducing glare.

Actually, while a specification for this type of fitting was in preparation, the Illumination Research Committee, at the request of the B.E.S.A., undertook a series of measurements of the brightness of a number of diffusing glass bowls of various shapes and sizes. The results of those measurements, besides being communicated to the B.E.S.A., have been published in the form of an Illumination Research Technical Paper (No. 4), so that all the information is available to the Industry, the illuminating engineer, or anyone else interested in the subject.

Another instance of a somewhat similar kind is the study of the effect which the position of the light source produces on the efficiency of a very popular type of open dispersive reflector (see British Standard Specification No. 232 (1926) and Illumination Research Technical Paper No. 3).

Both the above investigations were carried out in the Photometry Division of the N.P.L. For the brightness measurements in the work on diffusing glassware, one of the precision portable photometers was used to explore the surface of each bowl. In order to obtain absolute values of brightness with an illumination photometer it is, of course, necessary to have a diffusing white surface of known reflection factor ρ, so that this, when its illumination is E foot-candles, is known to have the brightness ρ E foot-lamberts or $\rho E / \pi$ candles per sq. ft. This surface can then be used to provide a standard of brightness so that the brightness of other surfaces can be measured by comparison with it. The accurate determination of the reflection factor of such a surface is not an easy matter, and the surface employed as a standard at the Laboratory has been carefully measured by several different methods, and is checked from time to time to ensure that no progressive change has taken place.

The measurements of the efficiency of the dispersive reflector were made on the mirror apparatus usually employed at the Laboratory for obtaining polar-curves of light distribution. The apparatus consists of a heavy iron pillar which supports (*a*) a large plane mirror tilted at an angle of 45° to the horizontal axis about which it can be caused to rotate, and (*b*) a long arm which rotates simultaneously with the mirror about the same axis, and which carries at its outer end a bracket to support the light-source and fitting. A toothed-wheel and chain device ensures that the fitting is maintained in the upright (or pendent) position as the arm rotates. The light from the fitting is reflected by the mirror along the prolongation of the horizontal axis referred to. Situated on this prolongation, and at a convenient distance from the mirror, is an ordinary photometer head which moves along a bench of the usual type so that candle-power measurements can be made quickly and easily at various positions of the arm bearing the fitting. In this way the polar curve for the fitting is determined quite conveniently and accurately, and hence, by the application of the Rousseau diagram, the total flux emitted by the fitting within any given zone can be found.

The Effect of Illumination on the Ease with which Fine Work Can Be Performed.

It was stated at the beginning of this article that the Illumination Research Committee worked in close co-operation with the Medical Research Council. That body is responsible for the Industrial Health Research Board, which conducts investigations into the effect of various factors on the health and general well-being of workers and their ability to carry out different industrial processes. The effect of the degree of illumination on the ease with which a given visual task can be performed has often been the object of laboratory researches, and many ingenious tests have been devised to measure it. Some years ago it was decided to conduct a full-scale investigation of the matter, and as a convenient example of "fine" work, typesetting by hand in the printing trade was selected. Certain rooms in a printing works were chosen, and the operatives worked all day entirely by artificial light. The intensity of the illumination was changed between the limits of 1·3 and 24·5 foot-candles, and both the output and the frequency with which errors occurred were measured at each illumination, as well as under ordinary daylight conditions. The results obtained were very striking. They showed both a progressive increase in the amount of work performed and a continuous decrease in the frequency of the errors as the illumination was increased, at least as far as 20 foot-candles. At this level, the normal values found under ordinary daylight conditions had been reached.

A later investigation was made to try to determine the most suitable illumination system (as regards distribution of light) for the same process, but the results obtained were somewhat inconclusive. Both these investigations have been described in joint Reports of the Industrial Health Research Board and the Illumination Research Committee.*

* "The Relation between Illumination and Efficiency in Fine Work (Typesetting by Hand)" and "The Effect of Different Systems of Lighting on Output and Accuracy in Fine Work (Typesetting by Hand)," by H. C. Weston and A. K. Taylor. 1926 and 1928.

NOTES ON PLANT AND PROCESSES

Galvanizing *v.* Rust.

The whole world to-day depends so largely upon iron and steel for its very existence that the problem of the prevention of rust is one of universal importance. It concerns not only the pocket but the well-being and safety of each individual in the community. Of considerable interest, therefore, is a booklet recently published by Messrs. G. A. Harvey & Co. (London), Ltd., of Woolwich Road, S.E. 7, dealing with the cause and prevention of rust and corrosion in iron and steel.

What is rust? In simple language it may be said that the rusting of iron and steel is a special case of corrosion depending upon the combined influences of moisture, oxygen, and carbon dioxide, the process being accelerated by the presence of acidic substances in the atmosphere. The booklet then goes on to explain the method of protecting iron and steel from corrosion by a coating of zinc or galvanizing.

Zinc itself, while not resistant to chemical corrosion, has been shown to possess an extraordinary good resistance against ordinary atmospheric influences; zinc does not rust, and the coatings have a protective action when applied to steel or iron surfaces. While the covering action of these coatings is extremely valuable, they also possess the very important property of exercising electrolytic protection.

The firm's "Harco" hot galvanizing process is then explained, by which the zinc is definitely alloyed with the surface of the iron. This coating, it is stated, is composite in character and really consists of several layers merging one into the other, so that there is no really sharp boundary between the iron surface underneath and the pure zinc above. An important feature of this process is that manufactured articles can be galvanized after they are made, which ensures all surfaces being completely coated, with the result that the rust-producing influences are entirely excluded.

Main and Gland Cocks.

A catalogue recently issued by the Audley Engineering Company, Ltd., of Newport, Shropshire, describes, with illustrations and full specifications, the firm's ranges of main and gland cocks, air cocks, foot valves and strainers, a large number of which are supplied to the gas and chemical industries.

In the Audley cast-iron main cock of the heavy pattern with hexagonal ends, the port in the plug is approximately full area. Each plug is carefully ground and lapped in, and every cock is tested before dispatch. The top of the plug is made flush with the body, thus preventing corrosion of the machined surface and ensuring correctly lapped bearing surfaces. A "D"-shaped steel washer and dished steel cap on the bottom of the plug supersede the old cast-iron cap that was so easily broken. The washer bears on a machined surface on the body, while the cap and set pin retain the plug by tension. No slackening of this tension occurs whichever way the plug is turned, because the washer and cap turn as an integral part of the plug. All screwing is accurate to certified gauges and the ends in alignment.

THE "JOURNAL" TECHNICAL RECORD

Which contains Full Reports of Meetings of Gas and Allied Associations

North of England Gas Managers' Association
(Auxiliary Section)

The Twenty-Second Half-Yearly meeting of the Auxiliary Section of the North of England Gas Managers' Association was held on Saturday afternoon, June 13, at the Offices of the Newcastle-upon-Tyne and Gateshead Gas Company. There was a large attendance, presided over by Mr. J. E. DIXON, Manager of the Elswick Works of the Newcastle Gas Company, who delivered an Address.

ADDRESS

By the Chairman, Mr. J. E. DIXON, M.Inst.Gas E., of Newcastle.

Gentlemen,

I thank you most sincerely for having conferred upon me the honour of being your Chairman, and assure you that I appreciate very much your confidence. The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company have pleasure in extending to the Association an invitation to visit the Elswick Gas-Works, where there are items of interest to those connected with both manufacture and distribution.

The Elswick Works are situated upon an old works site of the Water Company, and gasmaking commenced in 1858. The works are near the town, at a low level, and the site is on a steep slope between the Carlisle Branch of the L.N.E.R. and the River Tyne. Originally coal was delivered from the trucks at the top of the incline, loaded into bogies, and hand charged into horizontal retorts. The coke after quenching was barrowed further down the slope and tipped over an embankment from the base of which it was easily filled into carts or loaded into barges.

The works reached a maximum capacity of nearly 5 million c.ft. in 1895, and an examination of the plans reveals a remarkable change in the ground space required for the different apparatus. To-day, with a maximum output of 6 million c.ft., the retort house area is reduced by two-thirds, and the purification plant floor space is doubled.

At one time the carbonizing plant consisted of benches of eight ovens, each containing seven retorts of 18 in. diameter in section, and similar benches containing "Ω" shaped retorts 20 in. by 14 in. were added from time to time to a total of 64 ovens capable of a maximum of 5 million c.ft. per day. These old-style retorts were in existence up to 1911, when the work of reconstructing the retort houses was decided upon. About this time continuously operated vertical retorts were establishing themselves as reliable gas-making units, and a tender was accepted for an installation of the Glover-West system. The reconstructed plant, which still exists except for one bench, consists of two houses; No. 1 containing 10 settings, each of eight 25 ft. retorts, and No. 2 containing 12 settings, each of eight retorts 21 ft. long.

After being in commission for 18 years, the reconstruction of one bench of the first plant was recently commenced, and such progress had been made with the demolition by the end of April as to permit the commencement of the brickwork of the new bench. The retorts will be of the "New Model" design (fig. 1, 1931 retort), and it is interesting to note that a return to the 25-ft. retort has come about; it must be remembered that the retorts although 25 ft. long are really only 21 ft. with the lower 4 ft. occupied by the steaming chamber for the dual purpose of cooling the coke and preheating the steam for the water-gas reaction.

Copies of a summary of particulars of the works plant are in your hands, and as the principles of the Glover-West vertical retort system are so well known I need not enter upon any detailed description of them. With this brief introduction and history of the works, I will pass on to relate how opportunities for improvement have stimulated interest and enlivened the usual works routine.

VERTICAL RETORT DESIGN.

The development of the vertical retort has moved rapidly, and experience in our own particular circumstances suggested minor alterations for trial. Throughout, the aim has always been an endeavour in favour of better conditions and greater ease of manipulation. No. 1 installation is of an early design, and although only 18 months elapsed before the building of the second house many improvements are prominent in it.

In tests made on 21-ft. retorts, previous to the erection of No. 1 house, it was found that Durham coal did not pass through so rapidly as coal of a less caking quality, and the 25-ft. retorts, built with the hope that an increase in throughput would be obtained, were the first of their kind.

DIAGRAM INDICATING THE DEVELOPMENT OF THE VERTICAL RETORT SHAPE AND TAPER AT NEWCASTLE-UPON-TYNE

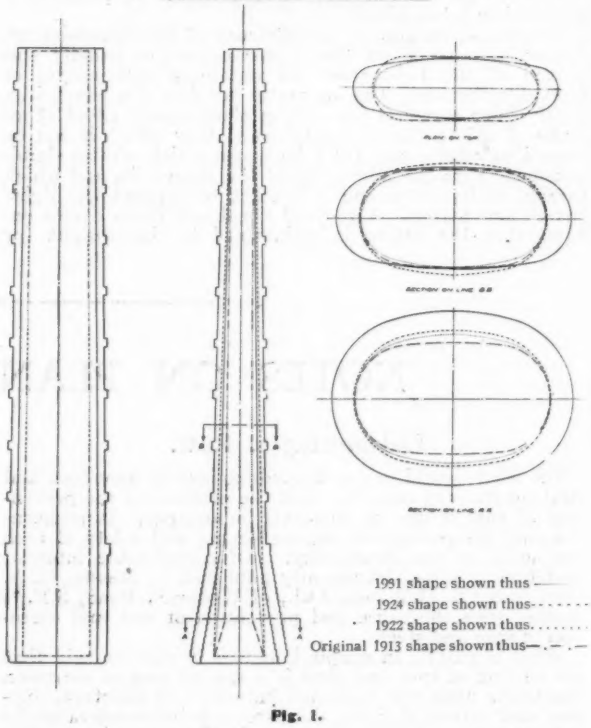


Fig. 1.

The additional length, however, was found to be of no advantage and proved that there was a limit to the useful length of a retort of a given minor axis—that is to say, thickness of the charge to be penetrated by the heat. It had also been definitely established that, other conditions being uniform, a longer major axis was the chief factor controlling carbonizing capacity, and in the No. 2 installation the major axis was increased by 6 in., the length of the retort being 21 ft.

In No. 1 house the horizontal section of the original retorts (fig. 1, 1913 retort) began at the top with straight sides and semi-circular ends, and this shape developed into an increasing ellipse towards the bottom. The retorts were constructed of fireclay sections, and the chamber immedi-

ately above the worm casing was of cast-iron. These retorts worked until 1918-19, an average life of 2000 working days, and the cast-iron portions were in use up to 1922. The flat sides disclosed an anticipated weakness; so during subsequent re-settings the retorts were built with a slight camber along the major sides (fig. 1, 1922 retort), as experience elsewhere had proved this effectively to overcome the weakness. A further trouble was observed at the bottom of the retort immediately above the extractor worm; the coal in use produced a hard coke, resembling coke oven coke in appearance, which on descending the lower portions of the retort as one block occasionally acquired a surface friction sufficient to tilt the mass into such a position as to cause it to jamb above and out of reach of the extractor worm. To counteract this some retorts were built with a greater taper on the major sides over the length of the bottom three chambers (fig. 1, 1922 retort). The alteration proved a success, but it was soon found that another inconvenience had been introduced; below the point where the change in shape took place spaces occurred between the charge and the retort wall, with consequent tendency to overheat the brickwork at such places.

Before deciding upon the next step it was necessary to review the position regarding the design of the retorts and make further observations under working conditions. It might be supposed that a standard retort capable of adequately carbonizing a non-caking coal would present difficulties when dealing with the behaviour of a strongly caking coal, yet most satisfactory carbonization is possible, provided that the operators give the necessary attention to the work and take advantage of the setting design, which provides for the variable adjustment of the distribution of the heat throughout the length of the retort, and the rate of coke extraction. Inattention to seemingly trivial detail is the root of many undesirable occurrences and eventually necessitates additional labour requirements, whereas competent and constant supervision not only secures easier working but ensures maximum results.

The retorts were designed, when fireclay material was in use and the temperatures comparatively low, for a capacity of about two tons per day; silica material was afterwards introduced permitting carbonization at higher temperatures, and the daily throughput of the retorts increased to 2.6 tons. It was not surprising, therefore, that the shape and taper failed to satisfy the more modern requirement.

For the efficient carbonization of a certain class of coal the retorts should be regulated to a previously determined set of conditions, and time must elapse before any alterations take effect and give steady working results. The exact length of time required varies according to the extent and number of the adjustments, which, in turn, depend upon differences in the characteristics of the various coals. The unscreened coal comes from many seams, and owing to traffic arrangements outside the works, it is impossible to control the order of delivery, and as a consequence the absence of satisfactory blending involves the carbonization of caking coals which change in quality so frequently as to limit the advantage of certain of the adjustments. The most important factor is to provide for the free movement of the charge, and after many trials a retort was eventually designed of the same elliptical section with more taper on the major sides (fig. 1, 1924 retort). The shape can perhaps be described as a compromise between that required for the maximum and medium caking coals of this district, and success over many years justified its adoption throughout the plant.

In the foregoing description of the shape and dimensions of the retort it must be borne in mind that we have been thinking of the original model. The retorts of the "New Model" which are being installed in the No. 1 bench are of the standard section, arrived at after experience with Durham coals, used by the Gas Light and Coke Company in London. It will be a point of great interest to see what our results will be with the "New Model." in view of the fact that the Glover-West retort has probably been working longer on Durham coals in Newcastle than anywhere else.

Vertical Settings Fired by Coal Gas.

Towards the end of last year an increasing demand for vertical gas coke suggested the use of coal gas as a means of heating the retorts, thereby making available for the market coke otherwise required for the producers. Difficulties in the efficient utilization of 500 B.Th.U. gas for this purpose were anticipated, and a beginning was made in a preliminary way with the idea of gaining experience in existing circumstances.

There is a Kent shunt-meter on an 8 in. diameter main which carries gas from the inlet side of the holder up to the centre of No. 2 retort house, where it divides into two 4 in. diameter mains which pass along the front of the benches with branches to each setting. At first the gas was introduced across the producer uptakes, entering each combustion chamber through the producer gas opening which was afterwards blanked off to eliminate any possible chance of air leaking into the setting. The air for combustion travelled in the usual way and reached the chambers by way of the secondary air flues after circulating round the bottom of the retorts. The flame was luminous and so dazzlingly bright as to prevent the accurate estimation of the retort temperature by eye or instrument. Maximum heats were not therefore attempted, and in the very short period of 10 to 14 days the ends of the burners were completely choked. The hydrocarbons in coal gas of 500 B.Th.U., when heated to a high temperature, decompose and cause the formation of carbon deposits; the preheating of the gas in this instance occurred inside the producer gas nostrils immediately before combustion, and some of the carbon accumulations were large and resembled lumps of coke. The metal burner ends did not stand up to the heat, and in instances the molten metal was likely to do damage to the brickwork.

In the next trial the producer nostrils were completely built up and the connections taken through the secondary air ports to the chambers where the gas was burnt from open pipes. This proved to be a move in the right direction, as the carbon deposits did not appear until after three weeks and then only in a thin layer tapering to a point at about 1½ in. beyond the burner; but the brightness of the flame was a great disadvantage. It was certain that the calorific value of the gas had to be reduced prior to combustion, not merely because of the carbon trouble but in order to get rid of the luminous flame. By introducing simple bunsen burners with fireclay ends in place of the open pipes the obviously easy method of using preheated air gave encouraging results. Although a nearer approach to the desired working temperatures was secured the flame was much shorter than that of ordinary producer gas and any attempt to increase its length, by reducing the amount of air admitted, caused a smokiness through which it was not possible to see the nearest retort surface. Temperatures of 1400° C. were, however, obtained on the first row of retorts, but the heat difference across the setting to the second, third, and fourth rows was excessive and lowered the average throughput per retort by about 10 p.ct.

The settings were designed to burn producer gas which yields a calculated volume of gaseous products more than twice the figure obtained from 500 B.Th.U. coal gas. This rather leads to the supposition that to lengthen the flame it would be only necessary to reduce the chamber width by half, but the plan was never tried because of the excessive cost of conversion. The lowering of the quality by dilution with inert gases from the chimney was next attempted, and lines followed by other investigators were adopted. The gas feed pipes were so arranged as to act as a set of injectors drawing inert waste gases into the mixing pipes with open ends as burners. At the time of writing some measure of success has been achieved; nevertheless there are many problems to solve in connection with the arrangement.

Retort house and works costs differ in detail at various works, but if it is desired to make comparisons as to gas and coke firing respectively then calculate the carbonization cost substituting in place of the coke used a gas consumption of 5000 to 6000 c.ft. per ton of coal, less credits for labour and material saved on fires, removal of ashes, repairs to producers, &c. The charge for gas needs careful consideration, and unless an exceedingly low price is possible gas firing is likely to be unprofitable unless a good price is secured for coke.

On the first setting fired by gas a 6000 c.ft. per hour high-capacity meter measured the quantity used, and the decision to extend the experiment brought forward another problem. The dry meter added greatly to the cost of the work and took up so much space in the retort house that it was advisable to use the more convenient orifice type meter. Delivery of such a meter could not be obtained for several months, and, as registration was an essential aid to efficiency, some means of indicating the gas flow had to be quickly manufactured. The Fuel Research Board's Technical Paper No. 27 on "The Measurement of a Rapidly Fluctuating Flow of Gas" so clearly described a means to obtain an indication of the velocity of gas passing through a pipe that it was comparatively easy to design and make instruments to meet requirements. These were tried out in series with the 6000 c.ft. dry meter, and the calculated scale compared with the calibrated scale was found to be remarkably accurate over the likely ranges of pressure and rates of flow. The beds fitted for gas firing have separate instruments, which provided a fascinating study during their design and construction.

Purification: Use of Catch Box before Working Boxes.

The 1912 to 1915 reconstruction included the provision of two sets of overhead purifiers, each consisting of four boxes, and erected at a point adjoining the site of the old purifier section. These sets were not provided with the customary catch boxes, and in order to remove the last traces of hydro-

gen sulphide, which might pass while a box was being emptied or the rotation charged, the old sets were worked on the outlet. Unfortunately, in catch boxes following the working boxes, it is extremely difficult to purify gas containing a mere trace of hydrogen sulphide, and the old boxes could not be relied upon. A further aggravation of the difficulty was evident; the boxes were intended for use with lime, and their small dimensions gave a very inadequate time-contact figure. The mains of these improvised "checks" were so connected as to permit them to be placed before or after the newer sets, and the data collected when working in the former position was usefully employed at a later date. Such was the deterioration of the boxes and awkwardness in effecting a change round that they were unsuitable for use with oxide of iron.

The maximum winter output of gas rapidly increased, and in 1925 the old sections were dismantled to provide the site for an addition to the purification plant. The maximum make per unit of ground space available was so large and the buildings and apparatus so closely grouped that it was only possible to arrange for four boxes with one catch upon the available land. The two other sections were without catch boxes, and, as one catch box could not conveniently serve three sections, an unusual problem had to be solved. The previously mentioned experience of working the old boxes in front of "A" and "B" purifier sections suggested a way of overcoming the difficulty.

steam. In America, a fan first circulates the gaseous mixture contained in the box; then air as required is gradually drawn in. With attention both methods are quite safe, and any overheating can be immediately checked by shutting off the air.

After consideration it was obvious that something requiring less attention, with no risk or danger in operation, would be desirable, and again the experiments with the obsolete set of boxes were of assistance. It had been found that they could be fouled as relief boxes, then placed last for revivification *in situ*, and within less than 24 hours be ready for relief duty. This inferred that purified gas containing about 0·5 p.ct. oxygen would revivify fouled oxide slowly but safely and without risk of overheating. The catch box is taken off when fouled and then, with inlet closed and an outlet open, a small exhauster draws gas from the outlet of purifiers and pumps it through the relief to the inlet of one of the sections (fig. 2). The exhauster may be left running overnight with no more attention than that given periodically to an air blower. There is no doubt that it takes longer to clean a box in this fashion, but the method has the sound advantages of simplicity and safety.

The use of the relief box prompted a desire to create an easy method of obtaining an approximate knowledge of the actual work done by each charge of oxide during the course of its working life. In the system adopted all particulars are recorded on loose-leaf sheets under several headings.

DIAGRAMMATICAL ARRANGEMENT OF CONNECTIONS BETWEEN CATCH BOX AND PURIFIER SECTIONS ALSO CLEAN GAS MAIN TO CATCH BOX INLET

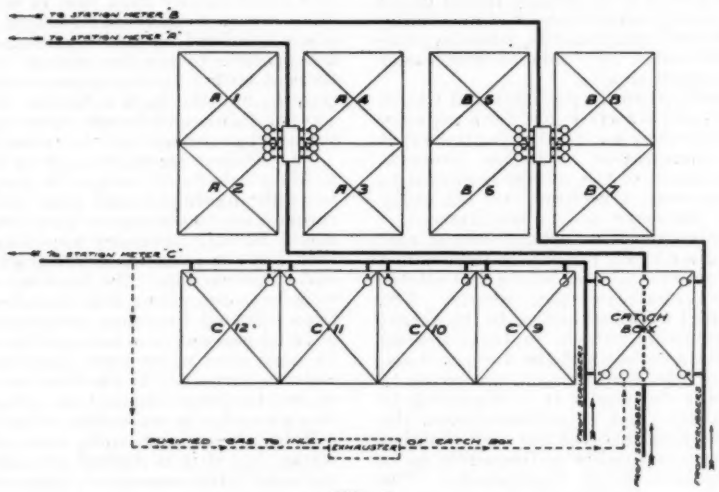


FIG. 2.

The "relief" or "catch" box was built with an arrangement of connections so that the gas of any stream from the scrubbers could be passed through and on to the inlets of the working sections (fig. 2). In normal operation a section at work has at least the last two boxes clean and changes in rotation are made before hydrogen sulphide shows on the outlet of the third box. If delay in changing results in one clean box only, then the catch box is placed in front of the set, and, owing to its position where the concentration of H_2S is high, it will quickly come into use and reduce the work to be done by the section. Further, after a short time the third box will be clean again and permit the change round to be made with confidence. This "catch box first" method has exceptional recommendations. When a purifier is laid off to be emptied the relief box is so active that the remaining three boxes clean up almost at once; revivification *in situ* occurs, and with the newly filled box again in rotation there are four very active boxes in excellent condition to make a most advantageous start. Another desirable feature is the fact that the box to be emptied may run last in the series for days, allowing ample time for partial revivification and cooling of the oxide before exposure to the atmosphere. This is a most effective method of counteracting the tendency of the material to fire, and, with the use of bronze working tools and means of relieving residual gas in all parts of the box, risks are greatly reduced.

Having included a relief box with the new section of purifiers it was necessary to make provision for the internal revivification of the contents. In this country, air is either drawn or forced through the material, and control of the reaction is attempted by admitting a proportion of live

Under the heading "Purifying Register" (sheet 1) the quantity of gas passed through each section is recorded. It is the duty of the charge hand to read the station meters daily, as well as after a change in rotation, and enter the information on the sheet. The right-hand columns show the quantity of gas passed through each box when first in series, and upon removal of a parcel of oxide the total gas passed is calculated and entered in red. This figure in millions of cubic feet is transferred to the right-hand column of sheet 2. It is practicable, from the information gathered over a long period, to determine approximately the number of cubic feet a particular class of oxide will pass before removal when in use for the first, second, or third time. Variations in uniformity of the material, overworking, acidity, &c., will cause exceptions, but without a standard the differences in purifying material might be obscured by other conditions.

An attempt has been made to record (sheet 2) the details concerning the parcel from first entering the box until it contains sufficient sulphur to warrant disposal. For simplicity each batch of oxide is given a reference letter, and a figure is added to indicate the number of times the parcel has been in use. Thus a parcel lettered "M" in or used for the second time would be referred to as "M2."

The left half entries give an idea of the sulphur concentration of the parcels at a glance, simple information no doubt but extremely useful. For instance, should any section work sluggishly, reference to the sheet may disclose the disquieting fact that all boxes contain parcels in use for the third time or another combination equally disastrous. This can be avoided by a judicious shuffling round of parcels. Many combinations of parcels work satisfactorily, but it is a

SHEET Nº1

PURIFYING REGISTER

DATE	TIME OF CHANGE	ORDER OF PURIFIERS				INDEX OF STATION METERS						TOTAL GAS	THOUSANDS OF CUBIC FEET PASSED THROUGH EACH BOX WHEN FIRST IN SERIES												REMARKS
		SECTION A				SECTION B				SECTION C			A METER		B METER		C METER		CATCH	SECTION A				SECTION B				SECTION C				
		1	2	3	4	1	2	3	4	1	2	3	4	INDEX	1000 CU. FT.	INDEX	1000 CU.FT.	INDEX	1000 CU.FT.	1000 CU.FT.		1	2	3	4	5	6	7	8	9	10	11	12	

SHEET Nº2

PURIFICATION

INFORMATION REGARDING PARCELS OF OXIDE

DATE	PARCELS OUT REVIVIFYING	PARCELS IN SECTIONS												CATCH BOX	PARCEL PUT IN	BOX Nº	DATE IN	WHEN DUE OUT	DATE TAKEN OUT	DATE TOP SURFACE BROKEN UP	% S	GAS PASSED MILLIONS CUBIC FEET				REMARKS
		SECTION A				SECTION B				SECTION C													F	2	3	T	
		1	2	3	4	5	6	7	8	9	10	11	12														

SHEET Nº3

PURIFICATION REPORT

DATE	TIME	SECTION A								SECTION B								SECTION C								CATCH	INITIALS
		PAPER TEST					LAST HOUR			PAPER TEST					LAST HOUR			PAPER TEST					LAST HOUR				
		CH.	1ST	2ND	3RD	4TH	GAS	AIR	%	CH.	1ST	2ND	3RD	4TH	GAS	AIR	%	CH.	1ST	2ND	3RD	4TH	GAS	AIR	%		
THURS.																											
FRID.																											

sound rule never to have more than two boxes in a section containing material in use for the third time.

The headings of the right half entries explain themselves. A particular feature is the assumption that a parcel will be due for removal during a certain month, and this is not so difficult a calculation as it may at first seem. At Elswick for many years attention has been more or less concentrated on two brands of oxide, and the information so accumulated guides the staff in anticipating the capabilities of the parcels and the approach of an occasion for special attention. With type " A " oxide first time in, it is found that the amount of gas passed varies from 85 to 100 million c.ft., second time in 75 to 85 million c.ft., third time in 60 to 70 million c.ft., the total before sale being between 220 and 260 million c.ft. With type " B " oxide, the batch must be removed after passing about 60 to 70 million c.ft. first time in, 70 to 90 million c.ft. second time in, and 60 to 70 million c.ft. third time in, the total before sale averaging 190 to 230 million c.ft.

To maintain reliable purification, it is important to keep a daily summary of the H_2S passing the outlets of each box (sheet 3). Where there are several sections the use of a Wanklyn Bottle, besides being inconvenient at night time and week-ends, takes up rather too much time. American investigators state that a strip of moistened lead acetate paper properly suspended in a current of purified gas will show no discoloration after one minute's observation if the H_2S content is less than 1/10 grain per 100 c.ft.; and therefore a test apparatus within the comprehension of any operator has been devised. A strong glass bottle contains the strip of test paper, and the gas stream is controlled by an orifice which maintains, as near as possible, a regular flow. The test extends over one minute, and for the purpose of uniform comparison the degrees of coloration are standardized and constitute a fairly reliable guide as to the conditions within the boxes. The foreman's report is available at 8 a.m., noon, and 4 p.m., and underneath the order of rotation he states the coloration represented by the symbols, " F," " H," " T," and " C," and understood by all concerned to infer a foul, heavy trace, trace, and clean papers respectively. The tests not only serve to indicate the state of the boxes at the time of the test, but the period taken for a clean box placed first to pass to the " F " coloration indicates its activity. These methods have been in use for many years, and an investigation along these lines can be recommended wherever difficulties in purification occur.

Sulphate Plant Improvements.

After many years of good service, the sulphate plant saturator became unsatisfactory, and the installation of a new one provided the opportunity of rearranging the plant lay-out. The necessity for a large storage room demanded the placing of the apparatus in a minimum of space, and in this connection the adoption of a bottom discharge saturator was of considerable advantage. The cost of manufacture becomes more important each year, and every endeavour towards a reduction must be made. Works costs are divided into labour and material; perhaps in many instances the former charge cannot be reduced, owing to isolation, size of plant, &c., but at Elswick an improvement was possible. The daily capacity of the plant was increased 50 p.ct. by the addition of three rings to the free ammonia still and an alteration to the scrubbing arrangements. The weak liquor from the carbonizing plant was collected in separate tanks before circulating through the scrubbers to produce a higher strength which further improved the still performance. Equally satisfactory results followed an investigation into the cost of materials. Of course, the economic use of raw materials is secured by careful control, and therefore attention was chiefly directed to the question of wear and tear on machinery for drying and neutralizing the salt. The conditions under which such machines work vary at different places, and the instances of economy submitted are not put forward as typical examples of what can be done, but rather as illustrating the relative improvement made at these works.

With the introduction of a process for the production of neutral dry sulphate of ammonia the corrosion problem of centrifugal baskets became acute, and replacements were very expensive. A riveted copper basket, repaired on two occasions, would last about 12 months and handle from 600 to 700 tons of sulphate. It was found that the wear took

place on the top and bottom portions, and the strengthening of these parts merely transferred the point of weakness to the vertical seam where after a period of work the rivets and holes stretched until the edges of the material were beyond repair. To meet this trouble a so-called "seamless" copper basket was procured, and the results of the subsequent trial were encouraging. A throughput of 1000 tons was obtained, and after repairs there is every reason to expect similar duty. Attention has also been given to baskets made of special metal, and one has been in continuous use dealing with 2500 tons of sulphate before repairs were necessary. The basket is in such good condition that several more years' life may be expected. It is hoped that in the near future the makers will manufacture a seamless basket of this type.

Prior to the rearrangement, the heat of the sulphate after leaving the centrifuge was utilized in the drying process, and for this purpose the crystals were elevated and allowed to fall through the warm atmosphere of the store. A rubber belt running between metal guides elevated the sulphate, but conditions were so severe that belt renewals occurred at intervals of three months. In the new scheme the sulphate had to be carried into the roof of the building, to feed a drier before being showered in the manner stated. Consequently, the elevator had to run at an angle of 50° and be capable of handling the crystals without breakage. Rubber will withstand the action of hot sulphate and free acid to a remarkable extent, so an 18 in. rubber belt was arranged to run between a driving pulley placed in the roof and a tension pulley fixed on the floor. The novel method of dispensing with guides and framework was introduced, and small wooden steps were bolted on at intervals to form ledges on which the material was raised. The elevator has given excellent service, and with very little attention the belt has been at work for a period of over five years.

A reluctance to use mechanical driers of a type which have a tendency to break the crystals induced a desire to tackle the problem of manufacturing one at the works. The drier introduced consists of a wooden drum, with distributing blades inside, revolving round a stationary heater. The success of the apparatus is found to depend upon the method of distributing warm air through the crystals showered round the heated drum. The machine is efficient and well worth inspection because of the low cost and simple operation.

In the time at my disposal I have only been able to touch briefly on these subjects, and have purposely refrained from giving a mass of figures and results, but I trust that the experiences brought to your notice this afternoon have been of interest.

In conclusion, I take this opportunity of expressing my thanks to the Directors of the Company and to Mr. F. P. Tarratt, the Chief Engineer, for permitting these particulars to be placed before you, and for the facilities they have given generally for our meeting to-day.

There was no discussion on the Address.

Mr. C. F. Barrow (Sunderland) proposed a vote of thanks to Mr. Dixon, and Mr. F. P. Fall (Sunderland) seconded the proposal, which was warmly carried.

Mr. W. Batt (Newcastle) proposed, and it was carried, that the Chairman, and Past and Future Chairmen, of the Auxiliary Section be presented with an illuminated address or certificate, as was done by the Senior Association.

It was proposed by Mr. Batt, and carried with only one dissentient, to have a social gathering at the termination of one or more of the half-yearly meetings, preferably after the winter meeting. The details were left to the Committee to consider.

On the proposal of Mr. Batt, seconded by Mr. T. T. Tarn (Darlington), the Chairman and Directors of the Newcastle-upon-Tyne and Gateshead Gas Company were heartily thanked for the use of the room in which the meeting was held, and for the opportunity of visiting the Elswick Gas-Works. The members afterwards inspected the works, and tea was provided by the Gas Company.

Yorkshire Junior Gas Association

"SHORT PAPER" MEETING

The May meeting of the Association was held at Wakefield, where, due to the kindness of the Chairman and Directors of the Wakefield Gaslight Company, and their Engineer and Manager, Mr. C. W. Ward, the members met at the Gas Offices, under the Chairmanship of Mr. J. W. Horwill, of Bradford (President of the Association).

NOTES ON THE CONSTRUCTION AND WORKING OF 10-FT. PURIFIERS.

By J. H. Richmond, of York.

The plant which is the subject of this short paper was constructed and put to work in 1928. As several very interesting features are embodied in the design, a short description of the installation, it is hoped, will be of interest to those present. The purifiers are four in number each being 30 ft. square and 10 ft. deep.

The first interesting feature to note is the fact that the usual cast-iron bottom plates are entirely dispensed with, their place being taken by a concrete raft. Anchor plates of cast-iron being bolted down to the raft take the side plates, and so make the joint between side and bottom. The sides, which are continuous, are built up of the usual segments and are bolted together.

The top decking is of mild steel plate, this being bolted to the side plates, the inside seams being electrically welded. This deck forms the gangway round each of the four covers of each box, and is supported on cast-iron columns in the box, and cast-iron brackets on the sides.

The covers are again of steel plate electrically welded. These are held in position by cast steel catches bolted to the deck plate. At a distance of some 4 in. from the outside of the cover a strip of mild steel flat on edge is welded to the deck, thus forming a trough. The purpose of this trough is to serve as a simple leak detector, water being placed in it to indicate any weakness in the joint. The joint between cover and box is made by means of a rubber ring, and, although deterioration has taken place, the joint is perfectly tight and has considerable life left in it. Before a cover is replaced the deck is thoroughly cleaned and painted with a graphite composition which serves the dual purpose of preventing corrosion and the adhesion of the rubber joint ring.

Four tiers of oxide are filled into the box in alternate layers of 18 in. and 15 in., the total weight of oxide being some 110 tons. The oxide is supported on grids, which in their turn are carried on T bars. These T bars are held in position by cast-iron columns in the body of the box, and by ledges cast on the side plates. The columns are built up in sections and are removed as the oxide is emptied, so giving a free working space. Each box is fitted with a draining sump and self acting syphon, to deal with condensate.

As the purifiers are situated some distance from the wet purification plant, the mains being partially overhead, considerable cooling of the gas takes place during the winter months. To counterbalance this the gas passes round a nest of tubes which are steam heated and in so doing the gas picks up some 20° Fahr. of heat, entering the inlet box at 65°-70° Fahr., which is considered a desirable temperature to promote the reaction.

Two ranges of valves control the flow of gas to the boxes, one range being outside the box, and the second actually in the box. The first are of the two way type, the valve seating at the top and bottom, according to the flow, and are the main inlet and outlet controls. Inside the box immediately in front of the inlet and outlet valves is a trinity valve, which, as the name implies, is a three-way valve, or perhaps a more correct description would be three valves. The trinity valve may be described as a T on its side, the branch of the T discharging between the second and third tiers of oxide. The top and bottom valves discharge above the top and below the bottom tiers. Each of the three valves may be operated individually, so that it will be seen that the gas is under complete control, the flow being made to take any course desired. In this way the box may have three distinct inlets and outlets, or in the case of any tier becoming hard this may be by-passed or partially by-passed according to the pressure thrown.

The inlet foul main is common to all boxes as is the outlet main, the stream of gas flowing from box to box by means of connections from outlet to inlet of each box until the last box—that is No. 4—which has a return main to No. 1 box. From this it will be seen that backward rotation is the method adopted.

As the valves are more numerous than usual an indicator is adopted to show at a glance the exact working position. The indicator is made up of a board fitted with sliding

panels, four in number, marked 1, 2, 3, and 4, each panel having spaces provided for small metal arrows to show the direction of flow as determined by the trinity valves.

In addition to the usual test pipes on inlet and outlet each box is fitted with four such pipes situated in between each tier of oxide so that the process of fouling or cleaning as the case may be, can be watched as it progresses through each layer.

Air for revivification is admitted to the inlet box, and is pumped in by means of a small blower driven by an electric motor, this air is metered, and the quantity passed may easily be increased or decreased as the make fluctuates.

The whole of the plant is covered by a steel framed structure, this having been designed to carry the telpher system by which the boxes are emptied and filled.

Working of the Plant.

Apart from the all-important clean gas at outlet careful attention to the progress of the H_2S is necessary to obtain efficient working. To this end daily tests are carried out. The H_2S content at inlet of the first taker, and as it travels through the tiers until clean gas is found, is estimated and logged. Pressures and temperatures on inlets and outlets are noted, so that a complete record of conditions obtaining is kept, and the life's work of any particular oxide may be easily referred to for comparison.

With four boxes it will be quickly realized that care is necessary in order to prevent more than one box fouling at one time, and still obtain efficient results. With one box off, 25 p.ct. of the unit is out of action, and it must be borne in mind that before a box is taken off for changing it is passing some 200-300 grains per 100 c.ft. This fact is all the more important when we consider the time occupied by emptying and filling a box. Our experience has shown that 1½ to 2 working days are taken up by emptying. The astonishing hardness of the spent material makes the work very laborious, and after ten hours men are quite unable to do useful work, so that the emptying time is carried on to the next day. Many attempts have been made to overcome the difficulty of this hardening of the material. The oxide becomes attached to the grids and judging from our experience the hardening proceeds to grow upwards through the tier. Experiments with various mediums such as breeze, sawdust, and specially prepared oxides to give a light mass have so far proved ineffective. Careful control of the gas and constant change of flow from top to bottom and *vice versa* give no relief. Our American friends are fortunate in being able to obtain a much lighter material than is available in this country. The feature of this material is its spongy nature, consisting largely, if not wholly, of wood chippings thoroughly impregnated with hydrate of iron, so giving an extremely light medium. From the appearance of the top few inches of each tier it would appear that the moisture content influences this hardness, as these top few inches are usually damp, light, and fluffy. This may indicate that the hot gas is responsible for hardening by its extraction of the moisture from the oxide in passing. On the other hand, if sufficient moisture is allowed to pass so that it carries throughout the box, the oxide becomes soggy, and a consequent rise in pressure cuts the box out before the oxide is spent. However, we find it possible to produce a saleable oxide in two foulings.

A WATER SEAL DIFFICULTY.

By A. Whiteoak, Hebden Bridge.

The bottom sealing lids of vertical retorts found on most gas-works to-day are, I believe, almost all of the self-sealing metal-to-metal type. The works with which I am connected is one of the few exceptions. We have three beds of Dempster-Toogood vertical retorts, the first bed of which to be erected, I might mention, was the first experimental bed built by Messrs. Dempsters.

Some of you will no doubt remember that the original method of sealing the bottom mouthpieces of these retorts was by means of a saucer-shaped lid filled with water, into which the lip of the receptacle dipped. This system still obtains on our first two beds, the self-sealing type of lid being used on our third and most recent bed. The water supply is obtained from a wrought-iron pipe which travels between the receptacles concerned, a branch pipe, of course, being taken to each lid.

These lids, which are opened every two hours for the extraction of coke, must be refilled with water on being returned to their working position.

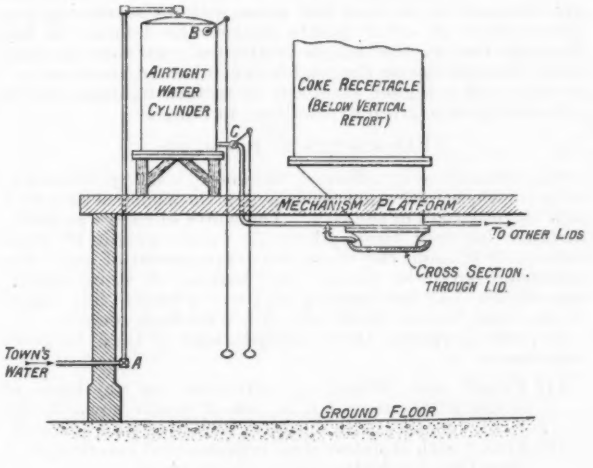
Owing to structural difficulties, we cannot have the type of receptacle suitable for self-sealing lids fitted at our works, and so we are obliged to continue with the old water system. Although this method is fairly reliable, it is not entirely so, as we have found to our dismay that the seals of odd retorts have been blown out at different times, resulting in the coke contained in the receptacle regaining its former redness through the aid of a supply of air from the unsealed lid, consequently cracking one, two, and sometimes three castings comprising that particular receptacle.

In an effort to eliminate this trouble, I have designed what I think will be a simple yet very effective apparatus which will automatically refill any particular seal which has been blown out during the absence of the stokers.

The apparatus will comprise an air-tight water cylinder of 50 gallons capacity or thereabouts, placed in position on the mechanism platform so as to be well above the level of the retort mouthpieces. This cylinder will be full of water, the supply entering at the top, and controlled by a valve. There would also be an air vent valve at the top, the water outlet pipe being fitted at the base of the cylinder, and also controlled by a valve. All three of these valves can be controlled from the ground floor if required.

Method of Operation.

From the cylinder outlet valve, the piping which already exists can be utilized—*i.e.*, a main supply pipe down the centre of the receptacles with branches to each lid. The method of operation will be as follows. After the coke has



been dropped from all receptacles concerned, valve "A" should be opened, and the water supply released will rush through the cylinder and forward to the lids, assuming valves "B" and "C" to be shut and open respectively. When the lids are observed to be all flooded, valve "A" should be shut.

To make certain that the emergency cylinder is full of water before being left, valve "C" should be shut, and then valves "B" and "A" opened. When the cylinder is full, water will commence flowing through valve "B," at which point the operation of the valves should be reversed—*i.e.*, shut valves "A" and "B," and open "C." The lids can then be forgotten until the time for coke extraction comes round again.

Should a seal be blown out at any time, the end of the water feed pipe will be consequently exposed to the atmosphere, causing water to flow in gulps from the emergency cylinder, air travelling up the same pipe to fill the space being caused by the water making its exit. The lip of the receptacle, which must be below the level of the feed pipe, will soon become sealed again, and the water, rising a little higher, will cover the end of the pipe from which it is running. Air will thus be prevented from running up the pipe, and a partial vacuum in the emergency cylinder will be created, which will restrain any further flow of water. While this action is taking place, none of the other retorts will be affected.

The advantages which I am hoping will result from the use of this system at our works are as follows. The risk of receptacles being unsealed for any appreciable period is entirely obviated, which will do away with our cracked casting trouble. The seal is guaranteed to prevent air admittance, perhaps even more so than the self-sealing lid. This will contribute towards a better gas. An easy means of relief is provided against excessive pressure in a retort by a water seal, which will also be an advantage.

All the eight retorts can be re-sealed by the operation of a single valve, instead of using eight separate ones.

Very little water will be wasted, as compared with the ordinary method of supply.

The sum of these advantages, when compared with the cost of installing the system, renders the latter negligible.

GAS FOR STREET LIGHTING.

By F. W. Hickling, of Bradford.

At a time when attention is being directed to the improved illumination of all thoroughfares, some experiments with a few types of modern gas-lighting equipment should prove of interest.

In deciding the type and size of unit to be adopted for a particular road, commercial considerations are the deciding factors in view of the illumination required. The lamps should give high candle-powers at angles which will produce even illumination, with as little variation from maximum to minimum on the road surface as possible. The midway points between the lamps should, therefore, receive as high a candle-power ray from adjacent lamps as can be arranged. This value will depend on the height and distance apart of the units, and on the candle-power of the source of light.

The British Engineering Standards Association recommend for various classes of road a minimum test-point illumination together with a minimum height of column. With a certain height of column, the rays 10°-20° below the horizontal will meet those from an adjacent lamp at a certain fixed distance. This meeting point has been found in practice to fix the most economical distance apart at which to place the lamps, and here the illumination on the road will be at a minimum. Modern reflectors and refractors are designed to increase this value without sacrificing any illumination at other points nearer the lamps. A less diversity factor—that is, the relation of maximum to minimum illumination on the road between two adjacent units—results, and a higher standard of surface lighting can be obtained from a given expenditure in lamps.

Experiments at Bradford.

Opportunity was afforded to make some photometric tests on these reflecting devices, by the construction of a new by-pass road in the city. The width of road was 40 ft., distance between lamp pillars 35 yards, height of lamp column 18 ft., and the staggered arrangement of units was adopted. An 18-in. square type lantern, of stout copper, was chosen, and the lighting unit was a four-in-line superheater type burner fitted with No. 2 medium mantles.

For test purposes, three modifications of these lanterns were used:

(1) Fitted with Holophane refractors in the form of single plates moved 1 in. out of centre towards the road, together with a white enamelled iron reflector.
(2) Fitted with stainless steel reflector and stainless steel directional reflectors as in the diagram.
(3) As No. 2, but fitted with white enamelled top.

In order to calculate the theoretical intensity of illumination on the road it is necessary to know the candle-power of the lamp at all angles below the horizontal at which the various rays will earth or strike the road surface. The following table shows the distances from a lamp 18 ft. high at which these rays earth:

Degrees Below Horizontal.	Distance from Lamp at which Rays Earth.	Degrees Below Horizontal.	Distance from Lamp at which Rays Earth.
5	206	30	31
10	102	35	26
15	67	40	21
20	50	45	18
25	39		

Each lantern was accordingly tested with the latest type of lumeter.

Each lamp was adjusted to give the best light by visual observation when burning 10 c.ft. per hour measured by a test meter and at a burner pressure of 2·5 in. water gauge, the calorific value of the gas being 500 B.Th.U. gross.

Readings were then taken from 30° above the lamp through every 5° down to 60° below the lamp, and the illumination into the road obtained by rotating each lamp in the horizontal plane to the viewing screen. Table 1 shows the results obtained.

For comparison No. 2 lamp was tested without reflector of any kind, and gave the figures below, yielding an average candle-power of 228 with 500 B.Th.U. gas at 10·25 c.ft. per hour, or 22·3 candles per c.ft.

Horizontal	225	40	255
80	240	30	250
70	245	20	230
60	250	10	170
50	255	0	105

With the conditions obtaining as represented in the diagram fig. 1, the minimum illumination point in the centre of the road from two adjacent lights A and B will be midway at the point O.

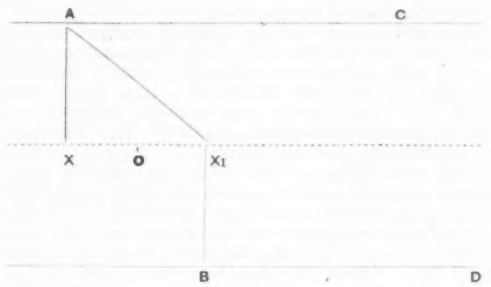


Fig. 1.

A calculation will show that the ray approximately 20° below the horizontal will earth at this point O from the lamps A and B.

Referring to Table 1, the lamp 1 with Holophane refractors has a maximum candle-power ray too near the horizontal, and of the other two the all-steel type gives the higher values round the desired angle.

The intensity of illumination actually on the road surface depends on the angle at which the light rays strike the surface and also their distance from the source.

The formula used in calculating this horizontal illumination is:

$$E = \frac{I \cos^3 \phi}{H^2}$$

where E = horizontal illumination in foot candles.
I = candle power in desired direction.
$\cos^3 \phi$ = cube of cosine of angle of incidence—*i.e.*, angle which light ray makes with vertical.
H = vertical height of lamp in feet.

To apply this formula the distance XX_1, between the two adjacent lamps A and B may be conveniently divided into ten parts and the illumination at these eleven points calculated. For example, at the point X_1, to find Cos ϕ for the lamp A imagine a triangle AXX_1, fig. 1. AX is half the distance across the road, XX_1 is the distance between lamps, and the sum of the squares of these values will give the square of the distance AX_1. This provides us with the distance X_1—that is, from the base of lamp A. A new triangle AA_1X_1 may now be constructed, fig. 2, where AA_1

Table 1.

Angle into roadway	0			7·5			15·0			22·5			30·0		
Vertical angle	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
120	18·5	5	7	21	5	7	25	5	7	23	5	7	16	5	6
115	28·5	7	12	29	7	11	29	8	10	26	7	10	22	7	10
110	40·0	11	80	41	10	82	37	10	82	35	10	85	28	10	10
105	48·5	175	174	52	165	200	46	170	175	43	170	178	40	165	160
100	80·0	205	200	78	215	200	80	205	200	65	205	200	45	200	195
95	210	225	270	140	270	265	145	225	245	83	225	245	70	230	225
Horizontal	490	275	284	470	285	285	510	260	260	350	250	265	215	250	257
85	635	375	350	660	400	335	680	360	280	650	350	280	400	345	270
80	425	425	350	400	420	350	425	400	340	500	370	300	450	340	320
75	225	425	360	255	450	350	225	410	360	250	400	355	250	360	355
70	200	425	320	200	425	310	200	400	360	215	380	350	225	360	330
65	200	390	320	200	400	300	200	385	350	210	370	350	215	360	335
60	200	350	300	200	400	300	375	340	225	225	370	350	215	360	300
55	200	310	285	200	350	285	360	300	215	215	340	310	225	315	285
50	227	280	274	205	290	275	225	300	275	235	300	285	235	295	275
40	225	225	255	225	240	270	225	255	225	225	250	265	235	240	250
30	215	200	250	225	200	237	225	210	225	225	225	225	235	220	225

Figures beneath columns 1, 2, and 3 give candle-powers in each case for the three types of lamps previously stated.

represents the height of the lamp column and A_1X_1 the path of a ray of light striking the road surface at X_1 thus:

Fig. 2.

The angle AA_1X_1 is equal to the angle of incidence and cosine AA_1X_1 is the relation $\frac{AA_1}{A_1X_1}$. The angle which this beam makes with the kerb may be found in the same way from the cosine of the angle $X\,A\,X_1$ in the first triangle considered. Reference to Table 1 gives the candle-power of the beam of this angle, and E may now be calculated at X_1, from lamp A.

The light from all four lamps A, B, C, D falling on the eleven points between X and X_1 is added together, and gives the theoretical horizontal illumination at these points. This calculation applies only to a level road, for with any change in gradient the height of the various lamps will vary in relation to the various points illuminated. In effect, with a road sloping from X to X_1 the lower half OX_1 will have slightly better illumination than the upper half XO.

Effect of Different Mantles.

To note the effect of different mantles, three types were tested with the lamp fitted with steel reflectors and steel tops. Table 2 shows the results obtained, the mantle in Col. 3, a mantle of close weave, maintaining higher illumination through a longer range of angles. This is a silk type mantle and possesses an appreciably higher durability.

Table 2

Angle.	Mantle.		
	1.	2.	3.
Horizontal	280	325	320
5	400	500	
10	425	520	475
15	430	475	
20	425	415	475
25	415	385	
30	350	350	380

All these reflecting devices operate by utilizing light rays lost in the normal lantern through the upper portion of the windows. In order further to direct rays normally passing out to the space beyond the side-walk, wing-type shields were devised of stainless steel and placed in the lower half of the lantern at such an angle that the reflected beams were directed on a line about one-third the width of the road.

Table 3 shows the calculated and observed values on the portion of road $X—X_1$ and using Type 2 lanterns.

Table 3.

—	Calculated Foot Candles.	Actual Readings.	
		As Supplied.	With Additional Side Reflectors.
Opposite lamp A	0·223	0·225	0·350
Position 2	0·191	0·233	
,, 3	0·132	0·150	0·145 (¼ way)
,, 4	0·095	0·082	
,, 5	0·081	0·062	
,, 6	0·074	0·057	0·095 (½ way)
,, 7	0·081	0·062	
,, 8	0·094	0·068	
,, 9	0·132	0·125	0·125 (¾ way)
,, 10	0·191	0·202	
Opposite lamp B	0·224	0·225	0·290

The observations and calculations were taken at intervals of 10½ ft.

These reflectors concentrate the heat rays as well as the light rays and attention must be given to the quality of glass used in the lantern. Chance's heat-resisting glass was finally decided upon, and was found fairly satisfactory, providing that care was taken when fixing the squares of glass in position to allow for expansion. Any falling-off in the polish of the reflectors due to corrosion, &c., would naturally have a lowering effect on efficiency, and to test this point a lamp was kept burning continuously in a damp fume-charged atmosphere. No pitting was noticed after three months' use and normal polishing with a little jeweller's rouge should keep the surfaces in first-class condition. The numerous reflected images of the mantles give the lamps a striking appearance, and enhance the advertising effect of good gas street illumination. Various other forms of reflecting and refracting devices are on the market. Among others may be mentioned Holophane refractors in the form of a ring completely encircling the mantles, semi-circular steel reflectors placed in the lower half of the lantern, and the stepped-tier of concave steel reflectors placed outside the "Rochester" type of lamp. All serve the purpose of providing a better and more evenly lighted thoroughfare, and a little experimenting will decide the type most suitable for the purpose required.

Scottish Junior Gas Association (Eastern District)

Free Services and Unaccounted-for Gas

In the "Journal" for June 3 we published the replies to a question on differential charges for gas, which were submitted at a meeting of the Association on May 16. To-day we deal with two further questions.

FREE SERVICES.

Reply by Mr. J. Kincaid, of Kirkcaldy.

The question was: *In view of the activities of electricity undertakings in giving supplies up to the meter position free of charge, should gas undertakings not consider it worth while to act in the same generous way to householders?*

Here is Mr. Kincaid's answer:

That the policy of electricity undertakings in laying services free of charge can be characterized as "generous" is perhaps a debateable point. Stripped of all verbiage, the policy simply means that the cost of laying service pipes is debited to, and becomes a charge to, the consumer later on, in the price of electricity supplied. There is no generosity, therefore, in the policy, although there is much that savours of foresight and business acumen. The system under consideration and its application to gas undertakings might be discussed as follows:

The advantages to be derived from the adoption of the policy are fairly obvious. In the case of new buildings, the knowledge that the gas authority is prepared to lay on a gas supply free of charge is undoubtedly an incentive to the architect or owner to consider favourably the use of gas for any purpose whatsoever. There is perhaps the psychological influence derived from the gas undertakings' "superiority complex" in not being afraid to back their contention that gas will be used as being best for the particular purpose to which it may afterwards be applied. In addition, the salesman who calls on the architect or householder with the object of selling gas appliances is freed from the necessity of having first of all to sell the service pipe which will convey the gas.

Again, take the case of a consumer whose service pipe is already taxed to the utmost, and who is anxious to extend the use of gas. With the advent of electrical competition, and in face of the proprietor's objection to pay for a larger gas service, the gas authority would be losing prospective business did it refuse to step in at once, and willingly accommodate the gas consumer.

Gas carried free to the meter outlet ready for any use that may be required of it offers scope for the best salesmanship, and encourages the consumer to reward the enterprise of the supplier by a freer use of the commodity he offers.

There can be no objection on principle to free services, the only obstacle being that of cost. At present many undertakings, including my own, lay the part of the service pipe in the street free of charge. That section is the more costly to lay in view of the ever-increasing restoration charges. This work, I imagine, is usually charged to capital, but the portion now under consideration, if supplied free, might be charged to revenue account.

In Kirkcaldy there are 12,130 houses, shops, &c. The normal growth of the Burgh is taken at 110 houses per annum, to which may be added 20 for other buildings.

Taking an average year, I find that the amount recovered for the proportion of the cost of laying service pipes chargeable in the past to the property owner is £390. If this annual outlay were charged to revenue, it would represent an additional cost of a halfpenny per 1000 c.ft., which is almost negligible.

While no one will argue that cheap gas should not sell best, the largest consumption per consumer is not always found where gas is the cheapest.

The provision of free services is only one way of meeting the intensive State-aided competition of electricity. Every avenue leading to more efficient service to the user of gas must be explored, and no inconvenience should be considered too great to ensure the happy ideal of contented and enthusiastic consumers.

Satisfied consumers are a strong bulwark against any electrical menace.

In the discussion which followed, it was generally agreed that free services are desirable in these days of intense competition. The benefits derived from laying down service mains of larger diameter, when called upon to renew old small diameter pipes, were emphasized. Consumers invariably take advantage of the opportunity to use more gas.

Mr. Kincaid said there is the question of being asked to lay a service pipe for some few hundred yards, but, even then, he is in favour of free service, and he feels sure this is the policy of the Gas Industry.

Mr. David Yule pointed out that the difficulty of asking a consumer (a householder) to sign a guarantee for a number of years lies in the fact that he may not remain in that house for the whole period. Consumers do not like to be saddled with financial responsibilities of a house they have vacated.

UNACCOUNTED-FOR GAS.

Reply by Mr. DAVID VASS, of Perth.

The questions were:

(1) *Should the difference of temperature at consumers' meters and works station meter be taken into consideration in arriving at "unaccounted-for gas?"*

(2) *Should not such differences and their influences be shown as a separate item in gas-works statistics?*

Here is Mr. Vass's answer:

Having ascertained the quantity of gas sold inclusive of the gas used in works, and having deducted this from the gas made, we are left with a shortage. This quantity is the trading loss; and as this loss is irrecoverable and only to a limited extent controllable by the engineer, many engineers regard this quantity as "unaccounted-for gas." Perhaps it would be better described as "gross unaccounted-for gas."

Mr. Walter Hole, in the Chapter on "Unaccounted-for Gas" in his book "The Distribution of Gas," goes very fully into this question, and gives a list of seven sources of loss.

(1) Loss on gasholders and plant from station meter to station governors.
(2) Loss due to making connections for extensions and repairs on the distribution system.
(3) Loss due to leaky pipes and joints.
(4) Loss due to inaccuracy of consumers' meters.
(5) Loss due to condensation in mains.
(6) Loss on public lighting account.
(7) Loss due to the difference in temperature at which gas is sold and that at which it is registered at the works.

The questions put to me refer in particular to No. 7, and may incidentally include Nos. 5 and 6, which may be classed as incidents outside the control of the gas engineer. Nos. 1 to 4 are sources more or less under the control of the engineer.

Assuming we can arrive at an approximate percentage of allowance for Items 5, 6, and 7, and deduct this from the gross figure, we arrive at what might be termed the net loss.

The whole difficulty is to arrive at what is the correct percentage to allow for this deduction.

Taking the tabulated returns of 14 undertakings in Scotland published in the "'Gas World' Analysis" for 1930, I find that in only two cases the percentage shown as "unaccounted-for" coincides with the difference between gas made and gas sold, and in these cases I think I am right in assuming that the gas used in works is included in the figures for gas sold.

In the other 12 cases the average difference between gas made and gas sold is 7·44 p.ct., while the average under column as "unaccounted-for" is 5·82 p.ct., bringing out an average "*otherwise accounted-for*" of 1·63, which is not disclosed in the return.

This average of 1·63 is made up from figures ranging from 0·66 p.ct. to 3·84 p.ct.

In many of these returns the difference is accounted for by gas used in works, and by that figure being deducted before arriving at the stated "unaccounted-for."

Assuming that you calculate the volume of gas sold at the standard temperature and pressure to ascertain the loss as compared with corrected station meter reading, you must take into account the difference in pressure at which gas is registered in both cases. The station meter in smaller works may be working against 6-in. pressure, and in larger works at (say) 12-in. pressure, while the average pressure at consumers' meters will not exceed 4 in. This difference will account for an increased volume of from 0·5 p.ct. to 2 p.ct., and that allowance falls to be deducted from the percentage loss calculated on the standard basis.

An extra column in the statistics showing in one sum the percentage of allowance for gas used in works, and for "gas otherwise accounted-for," and leaving only losses under Items 1 to 4 to be stated as the "gas unaccounted-for" would undoubtedly be useful if universally adopted.

Put in that form it leaves to each engineer to determine what percentage of loss he can account for apart from actual leakage.

I think Mr. Walter Hole answers the question when he says:

> It would, of course, be a great mistake to generalize too freely from limited data, but there can be no doubt that the basis upon which the leakage account is determined needs very careful re-consideration, in order (*a*) that some discrimination may be made between real and paper leakage, and (*b*) that the leakage account of different undertakings may be tabulated upon some basis which is a really comparable one as between one and another.

ANNUAL OUTING AT ALLOA.

The Association's annual outing was held at Alloa on Saturday, June 13, when during the forenoon, in ideal weather conditions, over fifty members and lady friends met at the showrooms of the Gas Department.

The visitors first proceeded via the Alloa Docks to the works of the Alloa Glass Works Company, Ltd., where they were shown the process of bottle making, and enabled to see the important part played in bottle production by gas. The company were conducted over the works by one of the engineers.

The only hand labour used is when an occasional bottle is tested for weight, and when the bottles are transferred to the lehr for annealing purposes. When the molten batch has reached the working end of the furnace, it passes into a feeder which juts out from the exterior of the furnace. Here just the right quantity of white hot metal is lifted and dropped into a "blank" or "parrison" mould which is one of eight situated on the edge of a revolving table. As the mould travels round first the mouth of the bottle is formed, then compressed air is forced into it, making the glass hollow, and as it still travels round it is ultimately formed into the desired shape, and the mould finally opens and drops the bottle, which by this time has lost its bright red colour, into a finishing furnace, where a highly localized heat—provided by town gas and air blast—is applied to the mouth to remove any roughness.

From here the bottle is placed upon a conveyor by means of which it is transferred to the lehr, whose purpose it is to anneal or temper the bottles. The lehr is really another furnace like an arched tunnel, not, of course, so hot as the melting furnace. The temperature at the starting end is about 600° C. The floor of the lehr can be moved forwards as required, and the bottles are placed on it at one end and taken out at the other end, after being in the lehr about 3 hours. This period varies according to the nature of the articles.

THE ALLOA GAS-WORKS.

Subsequently the visitors were conducted to the Gas-Works of the Alloa Town Council.

The annual output of gas is 231 millions with a maximum daily output of 900,000 c.ft.

The carbonizing plant consists of a "Wilson" vertical retort installation (semi-intermittent type) put into operation on May 15, 1914 (Alloa being one of the first works in Scotland to adopt this system), comprising six beds of four retorts capable of manufacturing 1 million c.ft. of gas per

day, each retort carbonizing 3 to 4 tons of coal per day according to requirements; 16 retorts are in use during maximum demand, leaving 8 spare retorts.

The feed water for the boilers is obtained from a natural spring, the water having a total hardness of about 15 degrees. This hardness is reduced to 1½ degrees by means of a "Permutit" water softening apparatus. A soot-blower and dust-collecting apparatus for cleaning of flues is in operation. The consumption of steam for the vertical retorts is measured by a Kent rotary steam meter. The condensing plant consists of a water tube condenser capable of cooling 750,000 c.ft. of gas per day in addition to atmospheric condensers. The water tube condenser has an area of 3 sq. ft. per 1000 c.ft. gas cooled. The gas is washed and scrubbed by means of a Livesey washer, and Holmes patent brush scrubber; purifiers 20 ft. square are four in number. The exhausters are of the four-blade type, steam driven, by Messrs. Waller, and are in duplicate.

The bye-product plants consist of sulphate of ammonia, and tar distillation. Crude tar is distilled by means of Messrs. Woodall-Duckham's T.I.C. plant of 18 tons capacity per day, and road tar is supplied to the County Road Surveyors in the district.

At 1 p.m. the visitors met at the Townhead Restaurant, where the President, Mr. D. Yule, of Alloa, expressed his gratitude for the large number of visitors. He was confident that all would have a pleasant day. The programme for the day was useful and would prove entertaining.

On the call of the President, who made appropriate reference to the loss the Association had sustained by the recent death of Mr. J. P. Moyes, an Honorary Member, the visitors stood in silence for a few moments as an expression of the sorrow felt at the loss of their old friend.

Mr. Yule intimated that his Chief, Mr. J. W. Napier, Engineer and Manager, Alloa, had very graciously agreed to provide lunch. A very hearty vote of thanks was accorded Mr. Napier for this kindness.

Mr. NAPIER said it was a great pleasure to him to welcome such a company to Alloa. The evidences made manifest that the Association possessed great vitality and the quality of enthusiasm exhibited by individual members was noteworthy.

After lunch, a large number of visitors enjoyed a tour by motor coach along the Ochil "Hillfoots" to the famous Rumbling Bridge Falls, while golf and bowls were played by a number of gentlemen. Mr. William Balfour, Bridge of Allan, was skip to the winning rink of bowlers, while Mr. A. Morris, St. Andrews, returned the best score over the Braehead Golf Course.

At 5.30 p.m. the company again met at the Townhead Restaurant, where they were entertained at tea by the Alloa Town Council, and votes of thanks to those who had taken active part in the excellent arrangements made were passed.

Manchester Junior Gas Association

Visit to the Grappenhall Works of Messrs. Richmonds Gas Stove Company, Ltd.

AT THE GRAPPENHALL WORKS.

Wednesday, June 17, marked the Annual Ladies' Day of the Manchester and District Junior Gas Association, and they synchronized this popular event with a visit to Richmonds' Works at Grappenhall, Warrington. A large party, consisting of well over a hundred, were met at Warrington Station and conveyed by motor coaches to the works, which are situated about 15-minutes' run outside the town. Here they were received by Mr. Arthur Slack and Mr. F. W. Richmond (Directors), also other senior representatives of the Company.

The Chairman of the Company (Mr. H. M. Thornton, J.P.) was unavoidably detained in London, and a telegram was read from him expressing regret at his absence, and conveying his good wishes to the Association for a pleasant and interesting afternoon.

Mrs. Slack, Mrs. Park, Mrs. Holt, and Miss Roylance acted as hostesses to the lady guests.

A photograph having been taken, the visitors proceeded to the warehouse, where an event of special interest to the ladies had been arranged. Here, Miss E. Sanderson, Diplomée N.T.S.C. (one of the Radiation cookery lecturers), gave a practical demonstration of "New World" cookery. Using "Bungalow" "New World" No. D66DZ, Miss Sanderson briefly explained the details of a 6-course dinner she had prepared. The meal consisted of tomato soup, fish, entree, chicken, bread sauce, peas and potatoes, bread and butter pudding, and macaroni. This was all placed into the oven at the same time with the "Regulo" set at mark 7, at which point it remained during the whole of the cooking period. The party then divided into groups, each under the care of a "guide and counsellor," and proceeded to tour the offices and works. When the visitors returned to the warehouse at the end of 1¼ hours, the oven was opened, and the complete meal withdrawn cooked to perfection, and it was declared beyond criticism by all present.

During the course of the tour round the works each party was first conducted through the vast enamelling shops, which proved, as they always do, of considerable interest. The vogue of the grey-mottled enamel cooker has necessitated tremendous developments in this section of Richmonds' Grappenhall Works. A highly trained staff newly

PART OF RICHMONDS' ENAMELLING SHOP.

" housed " and using new plant are constantly employed upon the manufacture of the " Bungalow " and " Ranelagh " " New World " cookers in " Rado " enamelled finish. The separate and distinct methods employed to enamel cast iron as compared with sheet steel were explained. Each party examined the methods of fusing the enamel, and the sand blasting which prepares the metal surface for enamelling. Attention was drawn to the spraying booths, where castings are given a ground coat of the prepared enamel before being placed in heated ovens, en route to the muffle furnaces, where they are fired at suitable temperature. The process which follows is that of mottling, which is performed by hand by rows of girls, each in a smart white uniform.

After this the castings are again fused in muffle furnaces before they emerge with that beautifully smooth and durable surface—the product of many years of investigation and experiment.

The separate processes involved in the production of the white-enamelled crown plates, wall plates, door plates, and the mottled enamelled oven linings, &c., were also examined with considerable interest.

Manufacture of " Beam " Radiants.

The next departments to be inspected were those devoted to the manufacture of " Beam " radiants, the ladies being particularly interested in the advantage of the softer and more penetrating warmth which these new radiants ensure as a result of the greater proportion of infra-red energy they emit.

A visit was next paid to the foundry. This section of the works, one of the largest of its kind in the North of England, never fails to attract. Here the moulds are prepared, and castings made for all Richmonds' appliances. The daily output of the foundry is between 40 and 50 tons. The molten metal is conveyed from the cupolas to the various parts of the foundry by means of an extensive system of overhead runways.

Passing from the foundry, the visitors were shown the dressing and inspection of castings, where the work is examined to ensure that no porous or mis-shapen casting passes through.

The parties then proceeded to the grinding shop, where fire and cooker parts receive their smooth and polished surfaces. The harsh metallic screech, which is the result of dozens of iron parts being pressed on to swiftly revolving grinding wheels, always creates a diversion. Visitors cannot hear themselves speak; so, after noting the various methods employed to grind small and large castings, and the special suction plant which draws the metal grindings underground, away from the operatives, each party passed on to the machine shops, where row upon row of drilling, counterboring, and tapping machines cope with thousands of component parts which need millions of holes drilled into them in the course of a year's output.

Adjacent to the machine shops is the tool room; and here the visitors were shown how machine tools are made, and kept in condition for their arduous task of cutting the multiplicity of metal parts which need to be " machined."

Conveyor System of Assembly.

All members of the Association were much impressed by the conveyor to which they were next conducted. Here cookers were seen being assembled by this new system. Each cooker gradually takes shape as it travels from man to man on a continuously moving platform. At one end the first part of the cooker is placed on the conveyor, and, as it travels along, each operative adds his quota to its production, drawing his supplies from the store immediately behind him. By the time the work reaches the end of the conveyor, the cooker is complete, and is automatically carried away to pass its " reliability trials."

The visitors were then conducted through the press shop, where crown plates, wall plates, oven linings, browning shelves, and other sheet steel parts are either pressed or stamped into their respective shapes.

Water Heater Department.

The water heater department, which was next explored, gave striking evidence of the increased popularity of gas in this field of domestic need. The demand prevalent for the " Equator " thermal storage water heater and the " Newlyn " storage sink boiler has taxed the resources of this section of the works, which has been extended to cope with the expansion of this side of the business.

Row upon row of water heating appliances in various stages of production gave ample evidence of their popularity.

In an adjacent shop, operations were being carried out to ensure that each component part would stand up to its work, and that it would fit well, work well, and look well.

The next departments to be inspected were those in which Richmonds' " Period " and " Standard " series of gas grates, also the " Equator " and " Newlyn " thermal storage water heaters, receive their attractive " silver " and other equally popular " lustre " and cellulose finishes.

The tour of inspection led to the administrative block, which faces the Manchester Ship Canal. This is the only portion of the 25 acres of buildings which is not laid out on a single, ground-floor plan.

A short time was spent in the offices, noting the modern mechanized methods of recording, invoicing, costing, tabulating, &c.

The social and sports side of the Richmonds' organization was not overlooked, and the Sports Pavilion was visited for tea, and a tour made of the sports field, with its tennis courts, bowling greens, &c.

After tea, the President (Mr. C. H. Bamber, B.Sc.) proposed a vote of thanks to the Chairman, Directors, and members of the Technical Staff, which was seconded by Mr. A. L. Holton (Manchester).

Mr. Slack replied on behalf of the firm.

Mrs. Bamber (wife of the President) moved, and Mrs. Applebee seconded, a vote of thanks to the ladies who had acted as hostesses on behalf of the firm; and this was replied to by Mrs. Slack and Mrs. Park.

Every lady present received a handsomely bound cookery book, with her name stamped in gilt letters. This was greatly appreciated.

The Hon. Secretary (Mr. J. Alsop) asked the President to invest the President-Elect, Mr. H. B. Knowles, with the President's badge of office, as that meeting was the last to be held for the current session. Mr. Knowles will commence his official duties next October.

After a most enjoyable and informative afternoon the party left for home with a fuller comprehension of the many processes involved in the manufacturing side of gas-heated equipment.

London Juniors Visit their President's Works

On the occasion of their Annual Summer Visit and Ladies' Day on Saturday, June 20, the London and Southern District Junior Gas Association paid a visit to the works of their President, Mr. T. H. PRATER, of Margate, at the kind invitation of the Management of the Isle of Thanet Gas Company.

Arriving at Margate, the visitors were conveyed to the gas-works and to the Company's new showrooms at Cliftonville. As the works and the new showrooms were some distance apart, the party divided into two sections, one visiting the works before lunch and the other the showrooms. The Association were welcomed at the gas-works by the Engineer and General Manager, Mr. J. M. Campbell.

THE MARGATE WORKS.

The Isle of Thanet Gas Light and Coke Company obtained its first Act of Parliament in 1824, and in the last 53 years the make of gas has increased from 55 to 500 million c.ft. The present price of gas to ordinary consumers is 8d. a therm. The maximum daily make of gas occurs during August and is approximately 2 million c.ft.

Coals (amounting to approximately 29,000 tons) required for carbonization are brought by steamers, motor vessels, or barges, direct from Yorkshire or Durham to Margate Harbour. The coals are unloaded from these vessels by means of the Company's Priestman No. 20 travelling steam crane, with derricking gear, and fitted with a double-chain grab of about one-ton capacity, which delivers the coals into six-ton trailers, which are hauled to the works about half a mile distant by 22-H.P. paraffin-driven Fordson tractors. By this system, over thirty tons of coals per hour can be dealt with on an average. The coals are passed through breakers and delivered into either of two stores; they are raised by bucket elevators (1) to continuous rubber belt-conveyors, each 200 ft. long, with tippers, discharging direct into store or to cross conveyor belts to other parts of the store, or (2) into a 50-ton feeding hopper to supply the Babcock & Wilcox gravity-bucket elevator, discharging into 24-hour storage hoppers on top of No. 1 vertical retort bench, or (3) similarly elevating direct through a 35-tons per hour single-roll breaker to the 40-tons per hour Babcock & Wilcox gravity-bucket elevator and thence to tipping tray conveyor supplying into 48-hour storage hoppers over No. 2 vertical retort bench.

The gas-making plant consists of eight ten-ton Woodall-Duckham retorts in four settings of two; twenty five-and-a-half-ton Woodall-Duckham retorts (now in course of reconstruction) in five settings of four; also a one million per day Humphreys & Glasgow carburetted water gas plant with waste-heat boiler, and a special positive blower and "Connersville" crude gas meter. The exhausting, condensing, washing, and purifying plant is of the usual character.

There are two holders with a total capacity of 1¼ million c.ft. The coke for sale is elevated by a balanced two-skip hoist to rotary screens, situated over 450-ton mild steel bunkers. A tar dehydration plant and ammonia still are also installed.

Steam for the whole works is raised by waste-heat boilers with auxiliary hand-fired Lancashire boilers, the feed-water being carefully conditioned by lime-soda softening, followed by passage through a base-exchange plant.

There are approximately 11,000 consumers supplied by 51 miles of low-pressure mains. Almost all the public lighting is by low-pressure gas lamps, numbering about 1700, all under automatic control.

THE SHOWROOMS.

The commodious district showrooms recently opened in Cliftonville has a floor area of 60 ft. by 26 ft., and forms a very useful adjunct to the Distribution Department. It has a splendid window frontage, two of which are partitioned off for display purposes. There are two floors, which are both employed to exhibit to the best possible advantage the several appliances in which gas can be utilized, many of them are "live" and capable of being demonstrated. The ground floor is handsomely equipped with counter, showcase, fire-stands, &c., and the walls are panelled to 8 ft. 6 in. in dark oak, while the upper floor is partitioned off, forming bays for hot-water displays, gas-fires, cookers, and small boarding-house equipment, together with Superintendent's Office and storeroom, and space for demonstration purposes. The external and internal lighting is particularly effective, and is by means of Sugg's lamps of different types to suit the conditions. Dark blue enamelled bronze lettering over the windows, and a bronze panel over the main door, with the Company's name in cream inlaid enamel letters, complete the exterior.

THE TOASTS.

Mr. WALTER HILLS, the Chairman of Directors, presided at luncheon, which was served at the Norfolk Hotel, and after the Loyal Toast had been honoured, in concluding an interesting and humorous speech, said: "It seems necessary that you should understand and believe that I make no claim whatever to the possession of any psychological or occult power. But you will see the reason for this disclaimer in a moment, when you realize that I am able to divine by instinctive intuition what is passing through the minds of all my colleagues on the Board and of the chief officials by whom we are so happily served, which, reduced to simple and sincere phraseology, is that we are all delighted to see you here to-day. We tender to you our very warm and sincere welcome, and we trust that the pleasures of your visit may be remembered by you all for many years to come."

Mr. J. M. CAMPBELL, proposing the toast of the "London and Southern District Junior Gas Association," associating with the toast the name of their President, Mr. T. H. Prater, said that he had a warm regard for this particular Association. He referred to the extraordinary growth of the Association since its inception 27 years ago with seven or eight members to the present time when it was 400 strong. He also referred to the high technical qualifications of members and to the fact that out of three medals presented to Junior Associations for papers read, two of these had been awarded to this Association. Juniors of to-day, he said, were specialists, and were able to concentrate on one particular matter and focus on it the whole of their abilities and bring it forward with very much greater value than used to be the case. Times were changed for the better, and juniors now carried on work on their own. Referring to their President, Mr. Campbell said that Mr. Prater had done very well during his year of office. He had travelled over 3000 miles in the pursuance of his duties, and he would be the first to acknowledge what has been done in regard to permission to do this by their Chairman. Many of the Association's Presidents had risen to high positions in the Gas Industry, and they would acknowledge what had been done towards that end by their association with the London Juniors.

Mr. T. H. PRATER, replying, thanked the members for the way they had received this toast, and referred to all Mr. Campbell had done for the Association. There was one feature that they as Juniors did not often have an opportunity of boasting about, but it sometimes did them good to realize that the Juniors attended their Association meetings in their own time. They had heard that he had travelled a fair number of miles, and for the privilege of doing that he had to thank their Chairman. The visit they had paid to their works and showrooms that day was a direct compliment to himself. Mr. Prater went on to refer to one or two points in connection with the works themselves, including the use of Durham coal in their vertical retorts, which they were convinced from laboratory work was going to give as good results as washed Yorkshire coal; and the results from this unscreened Durham coal had turned out to be equal to those from Yorkshire coal. He went on to mention the Margate Works' effective utilization of exhaust steam. There was at the present time, he said, a movement towards the abolition of smoke which meant wasted heat. In conclusion, he thanked his colleagues for giving up their time to show the members over the works and showrooms.

Mr. J. H. GOLDSMITH, the Senior Vice-President, proposed the toast of the "Isle of Thanet Gas Company," during the course of which he remarked that it was four years since the Association had the privilege of visiting Margate, and they would have noticed the tremendous improvement in the works. The fact that the Company were selling gas at 8d. per therm was all that need be said for the efficiency of the works and staff in general. He also voiced his thanks to the guides for kindly showing them round; and in asking those present to honour this toast he coupled with it the names of the Chairman and Directors of the Company who were with them that day.

The CHAIRMAN, in response, said that they were deeply sensible to the very kind way in which they had been pleased to receive the observations of their friend, Mr. Goldsmith, and he saw no good reason why he should minimize his eulogies.

After lunch those who desired visited either the works or showrooms, whichever they had not inspected during the morning, and during the afternoon and evening the members were free to explore Margate and its environments.

Institution of Gas Engineers

FURTHER WRITTEN COMMUNICATIONS

MR. HOLTON'S PAPER.

Mr. C. S. SHAPLEY: It is most opportune to have a paper on this important subject giving practical experiences with a process which, so far as gas-works are concerned, is absolutely new. Dr. Parker, at the 1929 Autumnal Meeting, caretully reviewed the indirect, semi-direct, and direct methods ot ammonia recovery as applied to gas-works practice, but the information with respect to semi-direct and the direct processes was practically all based on coke oven experience. It is therefore valuable to have this paper giving experiences and the difficulties encountered in adopting the semi-direct process to gas-works practice, and Mr. Holton is to be congratulated on the manner he has faced his problems as they have arisen; the information given will be very useful to undertakings putting up new works or replacing plant.

In the financial statement Mr. Holton gives a figure of £5050 as the saving in capital expenditure required when the semi-direct process is adopted. This sum will represent in interest and depreciation probably £505 per annum, but the labour costs based on the figures given for Bradford Road against Partington more than wipe this amount out in favour of the indirect process; also the increased working difficulties must be considered.

Mr. Holton has indicated that the increased labour costs are due to less flexibility of the semi-direct process with regard to working and labour, and this emphasizes the suggestion which has previously been put forward, that the semi-direct process is a unit comparable on the economic basis with the indirect process only on the larger sized works, but this may be materially modified when the disposal of the effluent liquor is a difficulty, and one realizes that the semi-direct process in conjunction with the proposed dephenolating plant has much to commend it. On the figures quoted for phenol in the liquor the estimated yield of 21,000 gallons of phenol appears to be an optimistic estimate. At what efficiency is the plant expected to work?

Can any information be given with respect to the quantities of phenol removed from the liquor by the benzole and carbon filters respectively? I ask this because the extraction of phenol by benzole is essentially one of solubility, and judging by the results obtained with an equal mixture of 90's benzole with a 0·49 p.ct. phenol solution at 60° C. given in the 5th Report of the Liquor Effluents Sub-Committee, the demand on the mechanical efficiency of the washer to ensure contact and solution must be very great, and it would be interesting to know how near perfection has been attained.

I am sure we shall all look forward to the presentation of later information of this pioneering enterprise.

DR. LESSING'S PAPER.

Mr. C. S. SHAPLEY: I would like to congratulate you on a very excellent contribution, and one which may have very far-reaching effects, both to the Gas Industry and on national well-being, because it must be admitted that an attractive smokeless fuel of low ash content and at a price competitive with coal would help considerably towards that ideal to which we in the Gas Industry are all dedicated—a smokeless atmosphere.

To the Gas Industry you produce proof of an astounding reduction in carbonizing time between clean coal and unclean coal, which is equivalent to increasing the capacity of the carbonizing plant and thereby reducing capital charges. You suggest that dust on the coal is the true explanation for the difference in carbonizing time between cleaned and uncleaned coal, due to dust arresting the tar vapours and clogging up the interstices between the coal. In view of this it is rather surprising that you suggest that coke breeze might be mixed with coal to prevent swelling during carbonization.

My experience is that breeze cannot be mixed with coal haphazard to produce a reasonable coke. Where mixing is contemplated, it is necessary to do it thoroughly, and briquette, otherwise the resultant carbonized product is a very friable coke, breaking down to breeze on handling, while the carbonizing time is also increased.

In Table I., under "Ash in Products," the combustibles left in the refuse amount to approximately 42 p.ct., 47 p.ct., 61 p.ct., and 59 p.ct. Can these figures be considered typical, and how would they be classed on an efficiency of cleaning basis?

The ash content of the smaller sizes of coke from the uncleaned coal are extremely high compared with the largest size. Our experience of ash in graded coke compares more closely with the ash in the coke from the clean coal. Of course, they are not as low, but are of the same order; and I suggest that the explanation may be that in the case of the uncleaned coal the smaller sizes have not been absorbed by the carbonized mass, and have been discharged from the retort practically as they went in. On the other hand, where the smalls are due to abrasion and rough usage of the coke substance, it is to be expected that they will be representative of the coke substance itself.

It is claimed that the coke from the cleaned coal gave a higher rate of radiation than the coke from the uncleaned coal. This is very interesting in view of recent work on carbonized fuels, when it was established that the cokes having the highest reactivity did not give the highest radiation from an open fire, and if this is true of the coke in question, which suggests that it has a low reactivity, it rather contradicts the popular idea that high reactive cokes are most suitable for water gas plant fuel in view of the results obtained when this coke was used on a water gas plant.

The remarkable results obtained in water gas manufacture are worthy of further investigation. The quantity of ash present cannot alone account for the wide differences betwen clinkering periods using clean and uncleaned coal —*i.e.*, 8 hours against 47 hours. What does Dr. Lessing suggest are the causes? Again, there is the increased thermal yield with the cleaned coal, which is another phenomenon difficult to associate only with the smaller ash content of the clean coal.

I think Dr. Lessing's arguments and balance-sheets are very convincing; and he has certainly indicated a line of action which will be a benefit to the Industry and the public generally.

MR. CLEGG'S PAPER.

Mr. G. E. CURRIER: The opportunity to build a complete new works falls to the lot of only a few gas engineers, and Mr. Clegg is one of the fortunate ones. He has evidently made the most of his opportunity, the lay-out of the Oswald Street Works being well planned. Mr. Clegg's predecessor, the late Mr. Leather, showed astute judgment in securing an excellent site with good sub-soil.

I would like Mr. Clegg to enlighten me on a few points which have occurred to me—namely:

1. From the results given in Table 3, I have calculated the make per ton to be 15,909 c.ft.; and as a yield of 75·9 therms per ton has been obtained, the calorific value of the coal gas would be 477 B.Th.U. I should like to know what means are adopted to reduce the calorific value of the horizontal retort gas to 477 B.Th.U., and can Mr. Clegg give a typical analysis of the gas? I note the make of carburetted water gas amounts to only 3·3 p.ct. of the total gas made.
2. There is no mention of a pan ash recovery plant in the paper, and it would be interesting to know the carbon content of the ashes from the step-grate producers in the horizontal retort settings.
3. Will Mr. Clegg kindly give us the cost of electricity generation?

The capital cost of No. 1 Unit per million c.ft. of gas made (taking the average make for the last two years) works out at £374, which appears to be very good, especially when the low net cost into the holder is taken into account. The figure of £374 per million c.ft. does not include the capital cost of the coke oven gas main or the stand-by C.W.G. plant comprising No. 2 Unit.

The complete cost of plant, machinery, and buildings given in the Appendix should prove very valuable to anyone contemplating work of reconstruction, and the results, so far obtained, are very good, and are in every way creditable to the Gas Engineer and his Staff.

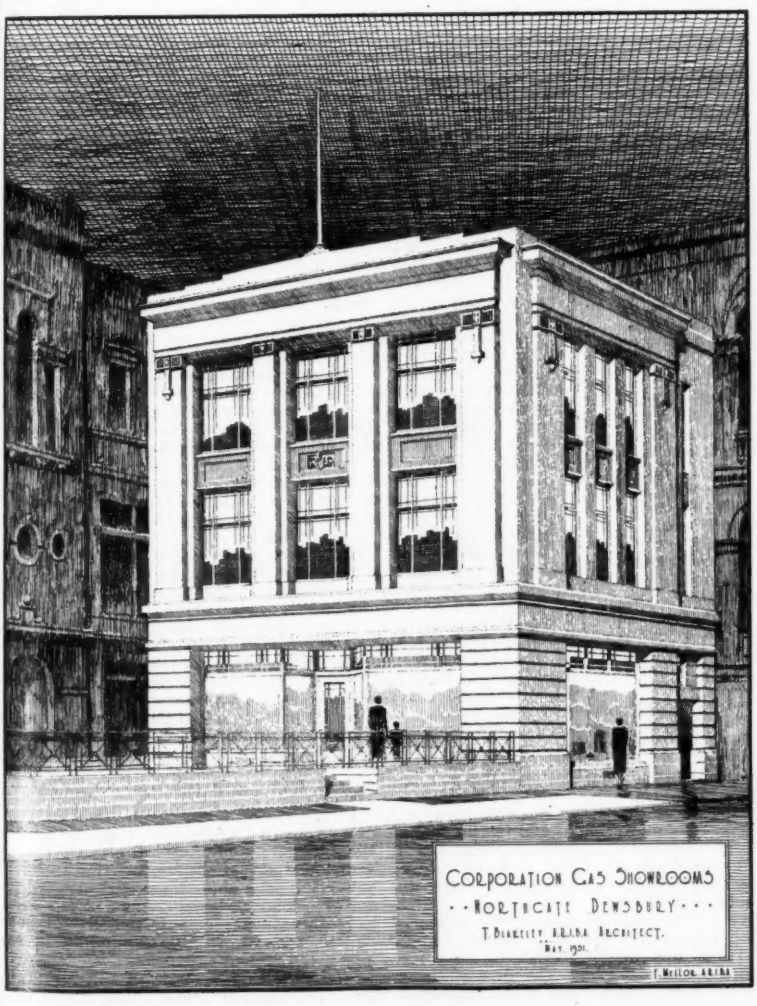
Refrigerator Sales in New York.

In our Review of the Proceedings at the Institution Meeting, we referred (on p. 738, "JOURNAL" for June 10) to Mr. G. M. Gill's remarks on the sales of refrigerators. We said that Mr. Gill suggested that the best way to visualize the amazing progress in the sales of refrigerators during 1931 is that their capital value amounted to £1,000,000. Of course, "1931" should read "1930;" and the figure of £1,000,000 refers to New York City alone.

MEMBERS OF THE INSTITUTION OF GAS ENGINEERS AT THE SOUTHALL WORKS OF THE GAS LIGHT AND COKE COMPANY ON JUNE 3.

IMPROVING DEWSBURY

New Showrooms for the Gas Department



On the "Flat-Iron" site at the junction of Halifax Road and Bradford Road, Dewsbury, the Corporation propose to build showrooms for the Gas Department. Tenders for the work have been approved by the Town Council. The sanction of the Ministry of Health to borrow the money required for the scheme is now being asked, and work will be commenced within a few weeks. It is estimated that the construction will occupy about six or seven months.

Designed by the Borough Architect and Surveyor, Mr. Tom Blakeley, A.R.I.B.A., the new building, in the modern classic style which is being adopted for many new shops in the big cities and towns of the country, will have an imposing aspect and considerably enhance the appearance of the neighbourhood. The new showrooms will take the place of those in Nelson Street.

The new building will be set back 87 ft. compared with the structures that formerly occupied the site. The three-storeyed structure will be 34 ft. high and 15 ft. deep from the facade to the rear, extending the full width of the site. There will be three showrooms, in which attendants will demonstrate all the latest gas appliances. The building will be well lighted from the outside through the medium of spacious windows, and from within by gas, operated by the new type of switch in the various rooms.

Our illustration, which appeared in the "Dewsbury District News and Chronicle," is from a drawing by Mr. F. Mellor, A.R.I.B.A., a member of the Borough Architect's staff.

Cannock, Brownhills, and District Gas Order

On Monday and Tuesday, June 1 and 2, Mr. J. F. RONCA (Director of Gas Administration) held an inquiry, at the Board of Trade Offices, Great George Street, Westminster, into the proposals of the Special Order, promoted under the Gas Undertakings Acts of 1920 and 1929, by the Cannock, Hednesford, and District Gas Company, Ltd., the chief purpose of which is to enable that Company to acquire by agreement the undertaking of the Ogley Hay and Brownhills Gas Company, Ltd., which is supplying gas in an adjoining district. It is also sought to extend the area of supply of the proposed amalgamated undertaking, to include certain adjoining parishes.

The Cannock Company was represented by Mr. Jacques Abady (instructed by Messrs. McDonnell, Jackson, & Co., Parliamentary Agents). Its technical adviser was Mr. George Evetts (Consulting Engineer), and Sir John Ferguson Bell (who is one of the Directors of the Brownhills Company) was also present.

There were objections by the Cannock Urban District Council (represented by Mr. H. Gibbon Pritchard, of Messrs. Sharpe, Pritchard, & Co., Parliamentary Agents) to proposals inserted in the Draft Order providing for the repeal of provisions in previous Orders relating to purchase of the Cannock Undertaking by the Urban District Council. The Brownhills Urban District Council also opposed, and asked that the Draft Order should not be approved by the Board, or that its operation should be suspended for a period, to enable them to obtain Parliamentary power to acquire the Brownhills Company's Undertaking. They were represented by Mr. Maurice Fitzgerald (instructed by Messrs. Lees & Co., Parliamentary Agents), and were advised on the technical side by Mr. Arthur Valon (of Messrs. W. A. Valon & Son, Consulting Engineers). A third opposition was by the Lichfield Gas Company, which entered into agreements with the Brownhills Company in the past concerning the supply of gas in some of the parishes which it is now sought to include within the limits of the amalgamated Company, or have already been included in the limits of the Brownhills Company. The Lichfield Company objected that the proposed scrapping of those agreements by this Draft Order would prejudice its future. It was represented by Mr. Cope Morgan (instructed by Messrs. R. W. Cooper & Co., Parliamentary Agents).

The proceedings on the first day were reported on pp. 882-3 of last week's issue of the "JOURNAL."

Tuesday, June 2.

Mr. FITZGERALD, addressing Mr. Ronca on behalf of the Brownhills Urban District Council, said that the Council opposed the Order on the question of principle. The Brownhills Urban District Council held very strongly that they had a better right than anybody else to purchase, and were more concerned than anybody else to ensure the provision of a proper supply in Brownhills. There were no overwhelming reasons why, in the public interest, the Council should not take over the undertaking. It was not at all clear to him that the scrapping of the Brownhills Works and the giving of a bulk supply from Cannock would result in economies, at any rate for the first ten years, the period during which the amortization of the capital represented by the scrapped works would be carried out. If, however, it were proved that the best course was to close the Brownhills Works and obtain a supply in bulk, then the Brownhills Company or the Brownhills Council were perfectly well able to do it without amalgamation.

The argument that, as the result of amalgamation, there would be better propaganda and more efficient service, gave rise to the inference, which could not be disguised, that the management of the Brownhills Company was at least unenterprising. That was not a suggestion which the Council was concerned to dispute. It was borne out by the fact that Mr. Evetts had budgeted for a considerable increase in consumption, presumably as the result of increased efficiency of propaganda and service. If the Brownhills Company had been unenterprising, that was a very good reason why the local authority should purchase the undertaking. Who could do propaganda work better than the Council, and who knew more intimately the needs of the district? The members of the Council were absolutely united in their determination to do all they could to purchase and control the undertaking. There was no evidence that the benefits which would be conferred upon the public by reason of the amalgamation could not be secured just as well, if not better, if the Council acquired the undertaking.

If economies were to be effected as the result of amalgamation, who would benefit? Obviously, some of the benefit would go to the existing Directors of the Brownhills Company, who, having drawn £50 each per annum, would join a Board of Directors who were receiving more than £200 each per annum. The amalgamated Company would have seven Directors. Mr. Evetts himself had thought it likely that the total fees of the Directors of the amalgamated Company would amount to more than their total fees as Directors of the two separate companies —unless there were to be two bodies of Directors, each having a different standard of remuneration. Again, the shareholders of the existing Brownhills Company would benefit, for they were to receive a dividend of £5 17s. 6d. p.ct. before any economies had been effected, although in only two years since the war had they received more than 5 p.ct. There was no incentive to reduce the price of gas for cooking in the Cannock area (on which the differential in the Brownhills area was based) until the price for lighting in Cannock (which governed the dividend) had been reduced from the present figure of 12·6d. per therm to the cooking price of 11·4d. per therm.

It was difficult to imagine, on the facts put forward by the promoters, a clearer justification for a local authority to ask for permission to purchase the undertaking. The Council wanted to ensure that the consumers in Brownhills, and not the Directors and shareholders of the Companies, should benefit. The Directors and shareholders of the Brownhills Company would not be harmed if the Council acquired the undertaking at a fair price; their undertaking was in the market, and if the price to be paid for it by the Cannock Company were fair, that price would be paid by the Brownhills Council. If it were not fair, then the Cannock Company should not be allowed to acquire it.

Councillor *T. E. Cox*, C.C. (a member and Past-Chairman of the Brownhills Urban District Council), in evidence, said that the question of the purchase of the Brownhills Undertaking had been one of the issues put before the electors at the elections in 1928 and 1931, and those who had supported that policy were returned each time. That indicated that the ratepayers were solidly behind the Council in this matter. Further, a meeting of the Council had been held recently for the special purpose of dealing with this point, and it was resolved unanimously by all present to promote a Bill to obtain purchase powers. With regard to a bulk supply, he said that the Walsall Corporation was in a position to provide it without extending its plant, if the Cannock Company was not prepared to provide it.

Mr. ABADY, cross-examining, pointed out that the trend of legislation of recent years had been against the policy of giving small local authorities the kind of power which the Brownhills Council was seeking. The Electricity Act, for example, removed the control of the supply of electricity, except as regards distribution, from the small authorities. Similarly, the tendency had been to authorize amalgamations of small gas undertakings.

Mr. Abady also suggested that, in view of the rateable value of Brownhills, it would not need much of a leak in the estimates in regard to the undertaking to result in the imposition of a considerable burden upon the ratepayers.

Councillor *Cox* said that the district was de-rated, and a considerable grant was received under the 1929 De-Rating Act.

Mr. ABADY commented that apparently somebody else would be called upon to pay for mistakes. He asked if Mr. Valon (the Technical Adviser to the Council) had advised the purchase.

Councillor *Cox* said that Mr. Valon had advised the Councillors that they would have to consider carefully whether it would pay them better to manufacture gas or buy it in bulk.

Asked if he had had any experience of running a similar undertaking, so that he could be sure that the purchase by the Council would be in the interests of the consumers in Brownhills, witness replied that he had not.

Re-examined, witness agreed with Mr. Fitzgerald's suggestions that if the undertaking were in the hands of the Council the duties of the present Secretary could be taken over by the Town Clerk, the clerical work could be done by the Council's existing clerical staff, and the rate collectors could collect gas revenue. Only the technical staff would be new.

Mr. H. GIBBON PRITCHARD, for the Cannock Urban District Council, dealing with the proposed repeal of provisions in earlier Orders concerning the purchase of the Cannock Undertaking by the Cannock Council, contended that by making those provisions Parliament had recognized that the Cannock Council was a suitable body to take over the supply of gas in Cannock: and this was a very important matter to the Council. It might be true that nothing in the present Order deprived the Council of any rights which they had at present, but the view of the Council was that if the provisions in question were repealed it might be contended hereafter that, by reason of that repeal, it was inferred by the Board of Trade that the suitability of the Cannock Council as a gas authority had been reviewed and the result was not favourable. Therefore, he asked that the provisions should not be repealed.

Mr. ABADY asked if it were claimed that the provision in the 1898 Order, giving the Council the right of purchase, subject to the necessary Parliamentary authority, should be extended to the new amalgamated undertaking.

Mr. PRITCHARD said it was not, but that the whole of the Cannock Undertaking as it existed to-day should be subject to the provisions in the 1898 Order relating to purchase. Nothing had been put forward in favour of repeal, except that the two undertakings were to be amalgamated.

His final point was that the proposed differential charge as between Brownhills and Cannock should not be reduced, because it was necessary for the protection of the Cannock consumers.

OPPOSITION BY THE LICHFIELD GAS COMPANY.

The objections of the Lichfield Gas Company to the proposals to add to the proposed amalgamated Company's limits of supply certain areas now in the Lichfield Company's limits were then put forward by Mr. Cope Morgan (Counsel for the Lichfield Company). He did not press his objections with regard to certain areas, but he did object strongly in respect of one area, and to the proposal to terminate agreements which had been made between the Lichfield and Brownhills Companies in the past.

The first of these agreements was one made in 1910, whereby the two Companies exchanged certain areas, inasmuch as this course was convenient to both, and was in the interests of the

public who required a supply of gas. Under the agreement the Brownhills Company supplied gas in Shire Oak (a parish which was then within the Lichfield Company's limits), and the Lichfield Company supplied in the Rural District of Ogley Hay (which was within the Brownhills Company's limits). In Orders promoted by the two Companies later, the exchange was made statutory. A point emphasized by Mr. Cope Morgan was that Shire Oak was a better proposition than Ogley Hay Rural from the point of view of gas undertakers, so that the Brownhills Company benefited by the exchange. It was also provided in the agreement, however, that if at any time the Brownhills Company decided that it would not make any more extensions of its works, the Lichfield Company was to be given the option to supply the Brownhills Company with gas in bulk, as it was well able to do. Counsel's complaint, therefore, was that, the time having arrived at which the Brownhills Company had decided not to extend its works further, the proposal was put forward that the Cannock Company should supply in bulk, and that the agreement with the Lichfield Company should be brought to an end. There was no justification for that, he submitted, either morally or from the point of view of public service.

Mr. Abady pointed out that there was no positive obligation to take a supply in bulk from the Lichfield Company, without regard to all circumstances. It was provided by the agreement that if there were a dispute as to price, an arbitrator must be appointed, and that he must have regard to the price at which the Brownhills Company could obtain a supply elsewhere.

Mr. Cope Morgan's reply was that the Lichfield Company had not been given the option, and it could not be suggested that it could not supply at a fair price. Coming to the second agreement, made in 1922, he said it provided that the Brownhills Company should supply in the Upper Stonnall district, within half-a-mile radius for a given point, within the Lichfield Company's area, the Lichfield Company retaining the right to supply there when convenient, and to pay the Brownhills Company a fair price for the plant it had installed for the purpose of the supply. Now, just when the time was arriving at which the Lichfield Company might desire to take over the responsibilities of supplying in that district, the Brownhills Company were proposing to include that district and the district beyond it within its own area of supply. The real position was that so far the Brownhills Company had supplied gas as agents of the Lichfield Company. Further, he pointed out that the Lichfield Company was anxious to retain that area, because, in view of pending developments, it might require to have access to Walsall through it. From that point of view it was most important to the Lichfield Company to retain it; if it were taken from the Lichfield Company, that Company would be cut off from Walsall.

Mr. Abady pointed out that the present Order did not provide that the Brownhills Company was not to extend its existing works at any time. The Brownhills Company would not remain a separate unit, but there would be nothing to prevent the amalgamated Company from extending its works and plant. Why, then, should it be stated that, instead of amalgamating with the Cannock Company, the Brownhills Company should give the Lichfield Company the option to supply in bulk?

Replying to the objections of the Cannock Urban District Council, he said that, quite apart from the sterilizing or paralyzing effect of purchase rights hanging over a gas undertaking, he saw no reason why the Cannock Council should have the right to supply outside its urban district. On the other hand, if the desire of the Brownhills Council were given effect to, then the Council would have control of an undertaking which supplied only part of its area, and would not have control of the undertakings supplying the other portions. He would stand or fall on the question of public policy. An indication of the Brownhills Council's aspirations with regard to propaganda and service was given by Mr. Fitzgerald's pathetic questions to Councillor Cox, to the effect that it would not be necessary to employ a Secretary because the work would be done by the Town Clerk, and that the clerical work and collection of revenue would be done by the existing staff of the Corporation. If it were to be pleaded successfully in every case in which amalgamation was proposed that the purchase rights of local authorities would be prejudiced, there never would be any amalgamations, and the country would be supplied by a series of small and relatively inefficient undertakings.

Discussing the position as to the Board of Directors of the amalgamated Company, he said it was proposed to amend the Articles of Association of the amalgamated Company so that as existing holders of the Directors' offices ceased to be Directors, no further appointments should be made until there were less than five, so that eventually the total number of Directors would be five. He emphasized the point that, not only would the Company avoid the payment of compensation to Directors for loss of office, but it would have a Board whose members were in touch with most of the districts supplied.

The inquiry then closed.

The Sheffield Gas Bill

South Yorkshire Coke-Oven Gas Grid Scheme

House of Commons Committee.

(*Before Sir* William Jenkins (*Chairman*), *Mr.* Greene, *Mr.* Hanbury, *and Mr.* Rowson.)

(*Continued from p.* 888 *of last week's* "Journal.")

The main purposes of this Bill are to enlarge and alter the powers and obligations of the Sheffield Gas Company with respect to the purchase and supply of coke oven gas, to extend the Company's ordinary limits of supply, and to increase its borrowing powers. (See "Journal" for Jan. 14, p. 105.)

So far as coke oven gas supply is concerned, the Bill seeks to give effect to the recommendations of the Area Gas Committee by extending the area within which the Company may purchase coke oven gas, and to enable it to construct a "grid" of mains whereby it may carry it and provide cheap supplies of gas to industry in South Yorkshire. Another Bill, promoted by the South Yorkshire Gas Grid Company, Ltd., which Company consists of a majority of the coke-oven owners in South Yorkshire, was promoted this session with similar objects, but the Companies discussed the matter and agreement was reached, and the Grid Company withdrew its Bill, leaving the Sheffield Gas Company a clear field. The South Yorkshire Grid Company remains as the organization through which the Sheffield Gas Company is to purchase the coke oven gas.

The Sheffield Gas Company was represented by Sir Lynden Macassey, K.C., Mr. F. G. Wrottesley, K.C., and Mr. Jacques Abady. There was opposition by the West Riding County Council, represented by Mr. Craig Henderson, K.C., and Mr. Thorpe; the Rotherham Corporation, represented by Mr. W. E. Tyldesley Jones, K.C., and Mr. S. G. Turner, K.C., the Swinton and Mexborough Gas Board, the Wath, Bolton, and Thurnscoe Gas Board, and the Rawmarsh, Wombwell, and Stockbridge Urban District Council, all represented by Mr. Thorpe; and the South Yorkshire and Derbyshire Gas Company and the Royston (Yorks) and District Gas Company, Ltd.

Last week we reported the proceedings on five days, up to the end of Thursday, June 11, together with the announcement of agreements arrived at on Tuesday, June 16. Below our report is resumed.

Friday, June 12.

Mr. *A. W. White*, of the firm of Messrs. Cash, Stone, & Co. (Chartered Accountants), who said his firm had acted for the Sheffield Gas Company for many years, gave particulars of the capital of the Company, and general statistics with regard to the operations of the Company. The total authorized capital of the Company was £2,336,968, of which £1,736,968 had been issued, leaving £600,000 unissued. The loan capital authorized was £1,168,484, the amount issued being £580,000. Although the estimated cost of the grid scheme was £500,000, the new borrowing powers asked for under the Bill amounted to only £350,516—this sum, with the unexercised capital powers, amounting to £1,589,000. With regard to gas made, &c., figures were given showing that whereas in 1917 the Company carbonized 513,595 tons of coal, in 1930 this quantity had fallen to 28,251 tons, owing to the large purchases of coke oven gas, which amounted to 4,754,960,000 c.ft., as compared with 382,516,000 c.ft. in 1919.

Pointing out that the Company was a basic price Company with a basic price of 7d. per therm, witness said the Company had paid dividends of 6½ p.ct. for the past three years, 6 p.ct. in 1927, and smaller dividends in the preceding years, down to 5 p.ct. in 1922. The basic dividend was 5 p.ct., so that, by being in the position to distribute a higher dividend in recent years, the Company had been supplying gas at a price below the basic price. There was, therefore, every incentive to the Company to keep the price of the coke oven gas and coal gas as low as possible. Giving a few details of the gas undertakings operating in the new coke oven gas area of the Sheffield Company, Mr. White pointed out that 80 p.ct. of the coke oven gas purchased in the area to-day was purchased by the Sheffield Company. Witness also dealt with the intention underlying the agreement that has been entered into between the Sheffield Company, the South Yorkshire Grid Company, and the coke oven owners. The main object was that the large quantity of gas going to waste should be sold. On the question of price it was stated that the Sheffield Company decided that 5½d. per 1000 c.ft. was the maximum price it could pay for gas from the grid as a whole if it were to be able to sell it again; and although the coke oven owners thought they ought to have a higher price, the Grid Company eventually agreed to this as a grid price, irrespective of the price which the Grid Company might pay to any individual coke oven owner. To this 5½d. per 1000 c.ft. for the crude gas there would have to be added transmission and distribution costs, &c. The whole basis of the negotiations between the Sheffield Company and the Grid Company was that the existing gas undertakings in the area should not be prejudiced; and it was for this reason that the coke oven owners were left free to negotiate local contracts. On the other hand, if the local gas undertaking did not require the gas, then the Sheffield Company could take it, and the local gas undertaking could call on Sheffield for a supply at any time it required. The prices to be paid by the local gas undertakings to

the Sheffield Company was to be determined by an arbitrator; and having regard to the varying circumstances of the different districts, it was decided, so far as the Bill was concerned, to leave the arbitrator a perfectly free hand.

Mr. TYLDESLEY JONES, cross-examining for the Rotherham Corporation, asked what price was to be charged to the gas undertakings for the gas from the grid.

Witness, referring to the Report of the Area Gas Company, said a figure of 10d. per 1000 c.ft. for purified gas was mentioned there as likely to attract a large amount of business; and the views of the Sheffield Gas Company coincided with that. The consideration of the matter was based solely on the report of the Committee. It was estimated that 40 million c.ft. per day must be sold for the price of 10d. per 1000 c.ft. to be possible; and to the figure of 5¼d. per 1000 c.ft. paid to the Grid Company by the Sheffield Gas Company, certain items had to be added. Interest, sinking fund, maintenance of the grid, &c., would bring that figure to 7·83d. per 1000 c.ft. The difference between that and 10d. per 1000 c.ft. represented the cost of purification, distribution, and profit.

In answer to a question as to the position if industries could not afford to pay 10d., and the 40 million c.ft. per day were not sold, Mr. White said the grid would not be constructed.

Mr. TYLDESLEY JONES put it to witness that neither Rotherham nor any other gas undertaking in the area was consulted as to the agreement between the Grid Company.

Answering the CHAIRMAN,

Witness said no estimates had been prepared of the manner in which capital expenditure would be incurred. It all depended on the way the demand developed. The 40 million c.ft. sale per day was contemplated when the grid was complete, and it would be futile to attempt to discuss the matter with the steel makers until the Company had Parliamentary powers and could get the gas. The gas would not be available until 1932.

This closed the case for the promoters, and the room was cleared while the Committee considered the position. After a short interval, the Chairman announced that the Committee would proceed with the hearing of the Bill on Monday, June 15.

When the Committee met again on Monday, June 15, Mr. Tyldesley Jones, K.C. (Counsel for the Rotherham Corporation, the principal opponents of the Bill), asked the Committee to agree to adjourn the proceedings further until the following morning, because he believed that by so doing they might save a good deal of time, and also might save the parties a great deal of expense.

This application for an adjournment was supported by Mr. F. J. Wrottesley, K.C. (Counsel for the Sheffield Gas Company), who also did not wish to go into details, but agreed that an adjournment at this stage might save time; and by Mr. Thorpe (Counsel for other opponents).

The Chairman said that if it were to the advantage of the parties, the Committee would certainly agree to the proposed adjournment.

The proceedings were accordingly adjourned until Tuesday, when the agreements indicated in last week's "JOURNAL" were announced.

Friday, June 19.

THE COMMITTEE APPROVES OF THE TERMS ARRANGED.

Clauses embodying the agreement arrived at between the Sheffield Gas Company and the Rotherham Corporation, on the one hand, and, on the other hand, between the Company and the Rawmarsh and Wombwell Urban District Councils, and Wath, Bolton, and Thurnscoe Gas Board and the Swinton and Mexborough Gas Board, were submitted to the Committee on Friday, June 19, and were approved.

The agreement, so far as Rotherham Corporation is concerned, provides for the maintenance of the supply of coke oven gas which it is now receiving from the Greasborough Works of the South Yorkshire Chemical Works, Ltd., and the Canklow Works of Messrs. John Brown & Co., Ltd., amounting to approximately 6 million c.ft. per day, through its own mains, which have been laid for the purpose. Of this 6 millions, some 4 millions is obtained from the chemical works and about 2 millions from Messrs. John Brown & Co. So far as the supply from the chemical works is concerned, the agreement provides that within four years from the passing of the Bill, or before the expiration of the existing agreement between the Chemical Company and the Corporation, whichever may be the later, the Corporation may require the Sheffield Gas Company to supply it with any quantity of coke oven gas into the existing main of the Corporation at the works of the Chemical Company, not exceeding 4 million c.ft. per day, or such quantity as the Company is obtaining or can obtain under the terms of the Bill from the Chemical Company, whichever quantity is the less. It also provides that if, and to the extent to which, the Corporation has not exercised its rights, as mentioned above, it may, at any time after the expiration of the period stated above, call upon the Sheffield Gas Company to supply gas into the main to an extent not exceeding 3½ million c.ft. per day, or such quantity as the Gas Company is obtaining or can obtain from the Chemical Company, whichever quantity is the less. There must be deducted from these amounts, however, any quantity of coke oven gas being supplied to the Corporation from the Chemical Company under any direct agreement.

The Corporation is also entitled to require the Sheffield Gas Company to give it a supply up to 2 million c.ft. per day of the gas it obtains from the Canklow Works of Messrs. John Brown & Co., Ltd., into the Corporation's main at those works, the amount again being subject to deduction in respect of any amount received by the Corporation direct from the Canklow Works.

These supplies are to be given by the Sheffield Company to the Rotherham Corporation at a price equivalent to a halfpenny per 1000 c.ft. above the price paid for the gas by the Sheffield Company. Inasmuch as there is provision in the Bill whereby the price at which the Gas Company buys coke oven gas can be varied in accordance with variations in the price of coal, the Corporation has power, under the agreement, to place its views before the Board of Trade when any alteration of the price is proposed.

For further supplies of gas beyond the 6 millions per day referred to, the Corporation is to pay a price to be agreed or determined by arbitration.

The clauses inserted in the Bill also embodied the agreement with the other inside gas undertakers, giving them the right to obtain from the Sheffield Gas Company supplies of gas at special prices, to replace supplies they are now obtaining direct from coke ovens in their areas. These prices, which were given in the "JOURNAL" last week, relate only to supplies replacing those already received by them, and not to further supplies they may require from the Sheffield Gas Company in addition.

The Swinton and Mexborough Gas Board is now receiving supplies of coke oven gas from coke ovens situated outside its statutory limits of supply, but within its coke oven gas limits. In the clauses added to the Bill, therefore, a proviso was inserted for the Board's protection in respect of these supplies, and it is placed in the same position in respect of those coke ovens as it would have been had they been situated in its statutory limits of supply.

A FURTHER REPORT FROM THE BOARD OF TRADE.

The policy adopted by the Board of Trade all along has been to support the Bill. It has supported the scheme of the Sheffield Gas Company because it provides a means of making available to industry the coke oven gas in the South Yorkshire area, after satisfying itself, of course, on the merits of the scheme. In pursuance of that policy it has made a supplementary report to the Committee since agreement was reached between the Sheffield Gas Company and the Rotherham Corporation. The report pointed out that under the agreement the Sheffield Company was under an obligation to supply to the Corporation, if the latter required it, a quantity of gas up to 6 million or 5½ million c.ft. per day, but that there was no obligation on the Corporation to take that supply, and to the extent the Corporation did not take it, that gas must be left unused, and the Sheffield Company could not enter into other arrangements for its sale. The Board asked the Committee to bear this in mind, from the point of view of the public interest.

Sir LYNDEN MACASSEY, K.C., for the Sheffield Gas Company, urged upon the Committee that the agreement between the Sheffield Company and the Rotherham Corporation was a practical one, and asked that it should be allowed to stand. They believed the public interest could be safeguarded. The effect of alterations would be to put an end to the agreement, and it would be unfortunate if the arrangements arrived at between the Company and the Corporation should be broken.

Mr. W. E. TYLDESLEY JONES, K.C., for the Corporation, suggested that the report of the Board of Trade proceeded from an entire misapprehension of the position. After all, the position which arose in this case was one which arose also in connection with electricity and water supplies, and there was available experience as to how these things worked. It was a mistake to assume that if any of the gas for which the Corporation were entitled to ask were not in fact called for, the Sheffield Company would not be able to use that quantity of gas elsewhere. The position was that the Corporation was taking gas from the two coke oven undertakings referred to in the agreement, and had closed entirely its own gas-works. As the demand for gas in Rotherham increased, the Corporation could meet the increased demand by taking more coke oven gas, or, if it could not get it, by manufacturing gas at its own works. The Sheffield Gas Company had estimated that 90 p.ct. of the gas available in this area would be required ultimately for use. As the demand for gas in Sheffield increased, the Company would take more and more gas from the coke ovens, and if it could not get enough coke oven gas, it also would have to manufacture more gas at its works. If the amount of gas the Company could obtain from the coke ovens were diminished because Rotherham wanted more, then the Company must manufacture more gas. All the coke oven gas available would be sold if there were a demand for it, and the question was merely whether, if still more gas were required, it should be manufactured at Rotherham or Sheffield. The Corporation's opposition to the Bill had been based on the point that the coke oven supplies should not be taken from the Corporation, which was dependent on those supplies, and sent to Sheffield, leaving the Corporation to make up the deficiency by manufacturing at its own works. A somewhat similar problem arose in cases where large cities obtained supplies of water from long distances. Various undertakings along the route of the mains asked for bulk supplies, and they were given such supplies, on certain terms. He held that the principle in the present case was similar, and that if the suggestion of the Board of Trade were adopted, Rotherham would be entirely at the mercy of the demand in Sheffield.

Questions were put by the Committee to Mr. J. F. RONCA (Director of Gas Administration at the Board of Trade), who said that the Board did not care whether Rotherham or Sheffield had the gas so long as it was used.

The Committee then deliberated in private, and when the parties were re-admitted to the room the Chairman announced

their decision that the clauses embodying the agreement should be added to the Bill.

THE SOUTH YORKSHIRE AND ROYSTON GAS COMPANIES.

Reference was then made by the Chairman to the demand of the South Yorkshire and Derbyshire Gas Company and the Royston and District Gas Company, who had asked at the previous hearing that they should be granted terms by the Sheffield Gas Company, for the supply of coke oven gas from the grid, not less favourable than those agreed upon with the Rawmarsh Urban District Council and other gas undertakers within the Sheffield Company's coke oven gas limits. The Chairman said the Committee were of opinion that an agreement had been made previously between the South Yorkshire and Royston Companies and the Sheffield Company, and that terms had been settled. Therefore, the Committee did not wish to hear anything further on that matter.

Mr. COPE MORGAN (Counsel for the South Yorkshire and Royston Companies) said he did not accept that as being the position. He believed he could show that it was not the position, and that if it became necessary to say so elsewhere he should do so.

Sir LYNDEN MACASSEY, K.C., said the Committee had given their decision, but that the Sheffield Gas Company would meet Mr. Cope Morgan's clients if they liked to discuss the matter further.

The proceedings then terminated.

Royston and Brodsworth Gas Bill.

This Bill, which provides for the amalgamation of the undertakings of the Brodsworth and District Gas Company, the South Elmsall and District Gas Company, and the Royston (Yorks) and District Gas Company, Ltd., and for vesting the amalgamated undertakings in the Royston and Brodsworth Gas Company, which latter Company the Bill gives power to incorporate, was considered by the Unopposed Committee of the House of Commons (presided over by the Rev. H. Dunnico) on Monday, June 15. It was also unopposed when in the House of Lords. (The detailed proposals of the Bill were published in the "JOURNAL" for Jan. 14, p. 105.)

Mr. R. C. DODDS (of Messrs. Lewin, Gregory, Torr, Durnford, & Co., Parliamentary Agents) said that the undertakings concerned were in the neighbourhood of Doncaster and Wakefield, and a little to the north of Sheffield. The existing Royston and District Gas Company, he said, was supplying, though it had not statutory powers. Within the proposed statutory limits of supply of the new amalgamated Company there was an intervening area in which another Company was operating without statutory powers, and the Bill provided that the new Company should not supply within that intervening area until it had purchased the existing undertaking there. (The Company in question is the Hemsworth, Grimethorpe, and District Gas Company, Ltd., and the Bill gives the proposed amalgamated Company power to purchase the Hemsworth Company's undertaking, subject to the approval of the Board of Trade, by agreement.)

The capital of the new amalgamated Company, he said, would be £200,000, of which roughly £195,000 was original capital, allocated to the shareholders of the existing undertakings; the remaining £5000 was additional capital, to be raised as and when required.

The CHAIRMAN asked if the usual compensation was to be paid to Directors.

Mr. DODDS replied that there was no compensation in this case.

The preamble was proved by Mr. Clough (of Messrs. Clough, Crabtree, & Ineson, Solicitors for the Bill), and the Bill was ordered to be reported for third reading.

Parliamentary Intelligence

[From Our Special Correspondents.]

House of Lords.

Private Bills.

A petition has been presented by Messrs. Martin & Co., on behalf of the Winchester Water and Gas Company, against the Southampton Corporation Bill.

The Gas Light and Coke Company's Bill has been returned from the Commons agreed to, with amendments.

Special Orders.

The following Special Orders, having been passed by the Special Orders Committee, have been approved by the House: Brighton, Hove, and Worthing; Pontardulais; and Portsmouth.

A Special Order on the application of the Wandsworth, Wimbledon, and Epsom District Gas Company has been laid before the House and referred to the Special Orders Committee.

House of Commons.

Private Bills.

The Gas Light and Coke Company's Bill has been considered and amended on report; the King's Consent having been signified, the Bill has been read a third time and passed.

The Royston and Brodsworth Gas Bill and the Sheffield Gas Bill have been reported, with amendments, from Committees.

The Chairman of Committees of the House of Lords and the Chairman of Ways and Means of the House of Commons having reported that the Edinburgh Corporation Transport Gas and Finance (Consolidation and Amendment) Provisional Order ought to be dealt with by a Private Bill, and not by a Provisional Order, a Bill under that title will be introduced in the House of Lords.

Special Orders.

The following Special Orders have been approved by the House: Pontardulais Gas Company (1930), Ltd.; Brighton and Hove General Gas Company; the Portsmouth Gas Company.

On the motion approving the Portsmouth Order, Major COLFOX asked the Minister in Charge what was the reason for it, what had made it necessary, and something of the history which had led up to it.

Mr. W. R. SMITH (Parliamentary Secretary to the Board of Trade) replied that the growth of the undertaking had necessitated additional works being erected upon their existing land, and the Order was necessary to enable them to carry out that development.

A Special Order on the application of the Wandsworth, Wimbledon, and Epsom District Gas Company has been presented and ordered to lie on the table.

Plans have been deposited in connection with the Kidderminster Special Gas Order and the Gosport and District Order.

Corporation Undertakings' Results for 1930-31

BINGLEY.

Councillor Tom Snowden, M.P., Chairman of the Bingley (Yorkshire) Gas Committee, presenting the annual finance statement, showing a net profit of £1524, expressed the opinion that it was high time gas consumers received the benefit from such profits instead of the money being utilized to subsidize the rates. He hoped the Council would in future consider the idea of using profits by reduction in the price of gas. The accounts showed that the showroom of the Department had made a profit of £281.

BLACKBURN.

A net deficiency of £2441 is shown on the year's working by the report of Blackburn Gas Committee, after meeting income-tax of £6446, and interest and sinking fund charges of £58,449. The total expenditure, £143,966, shows a reduction of £3563 on 1930, while the income of £202,103 was £10,262 less than last year. The gross profit carried to net revenue account is £58,137.

Mr. G. P. Mitchell, the Engineer and Manager, states that with the £5000 appropriated to relief of rates, and other items of capital expenditure, there is now a total deficiency outstanding of £20,697, a matter necessitating careful consideration. This adverse result is due to the depressed trade conditions prevailing. Weak markets for tar and sulphate were factors which seriously affected the financial aspect. During the past few years, extra charges had been thrust on the undertaking, including £20,000 transferred to the relief of rates.

Mr. Mitchell adds that comparing Blackburn's charges with other towns, consideration should be given to the fact that meter rent charges are not in vogue, and also that distinction of only 1d. per 1000 c.ft. is made between ordinary and prepayment consumers. The policy adopted had been warranted by the increased gas used by prepayment consumers, now amounting to 46·5 p.ct. With care the amount outstanding would eventually be eliminated.

The Borough Treasurer states that the gas deficiency for the year (£10,222) had been added to the accumulated deficiency brought forward of £10,475, making a total of £20,697. A further deficiency is anticipated in 1931-2, and he draws attention to the necessity of some action to liquidate the accumulated deficiency. The capital expenditure to March 31, 1931, was £1,128,920, of which £9066 was expended during the year. The total borrowing powers exercised amount to £1,123,863, of which £551,515 had been repaid. The total quantity of gas made during the year was 1,081,842,000 c.ft., a decrease of 44,735,000 c.ft., or 3·97 p.ct. below last year. The wage bill was £46,588. Sales of appliances had been astonishingly good.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see later page.]

Business on the Stock Exchange last week was dominated for the most part by international finance, and, with the exception of the large amount of interest taken in Woolworth shares, business in most sections was on the lean side, and prices moved within narrow limits; but the latest War Debts proposals from America will doubtless give a much-needed fillip to the existing jaded conditions of markets.

Gas stocks and shares passed an uneventful week, and as in the case of other sections the number of transactions was somewhat less than usual. This, however, can be attributed mainly to the fact that there is not sufficient stock available to meet requirements, and many standing orders still remain unfulfilled. There were therefore few price changes; and the only two increases were those of Commercial ordinary by 1 point to 94-97, and South Metropolitan 5 p.ct. debenture, also by 1 point, to 101-104. Imperial Continental weakened 10 points during the early part of the week but hardened later, closing only 5 points lower at 315-335; and at the local Exchanges Liverpool and Newcastle ordinary stocks declined a trifle.

Having regard to the financial vicissitudes experienced by many investors during the past year or so and, as mentioned above, the existing difficulty of procuring certain classes of gas stocks, investors are reminded that the ordinary issues of the larger undertakings, which are usually obtainable, give a very satisfactory return with high-class security. The following is a list of a few in this category showing the yield at the average market price:

—	Dividend 1930.	Present Price.	Yield. P.Ct. per Annum.
	P.Ct.		£ s. d.
Gas Light	£5 12s.	19s. 1½d.	5 17 1
Liverpool	6	100½	5 19 8
Sheffield	6½	106	6 2 7
South Metropolitan	6¾	103½	6 0 9
South Suburban	6½	103½	6 5 7
Tottenham	£6 12s. 6d.	104	6 7 5
Wandsworth	7	114½	6 2 3

Current Sales of Gas Products.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *June* 22.

The values of tar products are as follows:

Pitch is firm at 45s. per ton f.o.b.

Creosote, for export, varies from 4d. to 5d. per gallon f.o.b., according to specification.

Pure toluole is 1s. 11d. to 2s. per gallon; pure benzole, 1s. 5d. to 1s. 6d. per gallon; and 95/160 solvent naphtha, 1s. 4d. to 1s. 5d. per gallon in bulk *ex* sellers' works.

Pyridine bases are about 3s. 3d. per gallon.

Tar Products in the Provinces.

June 22.

The average prices of gas-works products during the week were: Gas-works tar, 17s. 6d. to 21s. 6d. Pitch—East Coast, 47s. to 47s. 6d. f.o.b. West Coast—Manchester, Liverpool, Clyde, 47s. to 47s. 6d. f.o.b.* Toluole, naked, North, 1s. 7¼d. to 1s. 7¾d. Coal-tar crude naphtha, in bulk, North, 5¾d. to 6¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 1s. Creosote, in bulk, North, liquid and salty, 3d. to 3½d.; low gravity, 1¼d.; Scotland, 3d. to 3½d. Heavy oils, in bulk, North, 5⅝d. to 5⅞d. Carbolic acid, 60's, 1s. 1d. to 1s. 2d. Naphthalene, £10 to £12. Salts, £3 to £5, bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port, it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *June* 22.

Very little new business is being placed, but refined tar for road-making is steadier as stocks are gradually being consumed.

Pitch.—More interest is being taken for forward shipment, and export value is now about 40s. per ton f.o.b. Glasgow. Home trade remains dull at 35s. to 37s. 6d. per ton *ex* works in bulk.

Refined tar to Ministry of Transport Specification shows a slight improvement in tone, but quotations remain at 2⅜d. to 2⅝d. per gallon f.o.r. works in buyers' packages.

Creosote.—Market continues steady with some grades quite scarce. B.E.S.A. Specification is 2⅜d. to 3d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3¼d. to 3½d. per gallon—all f.o.r. in bulk.

Cresylic.—Few orders are on the market. Pale, 97/99 p.ct., is 1s. 3d. to 1s. 4d. per gallon; dark, 97/99 p.ct., 1s. 2d. to 1s. 3d. per gallon; and pale, 99/100 p.ct., 1s. 5d. to 1s. 6d. per gallon—all *ex* makers' works.

Crude naphtha is steady at 4¼d. to 4⅜d. per gallon, according to quality, f.o.r. in bulk.

Solvent naphtha.—An improvement in output is noticeable. 90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade about 1s. 1d. per gallon.

Motor benzole.—Supplies are not too plentiful, but value remains at 1s. 3d. to 1s. 4d. per gallon f.o.r. in bulk.

Pyridines.—90/160 is 3s. to 3s. 3d. per gallon, and 90/140, 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole:

	s. d.		s. d.	
Crude benzole	0 6½	to	0 7½	per gallon at works
Motor ,,	1 1	,,	1 2	,, ,, ,,
Pure ,,	1 5	,,	1 6	,, ,, ,,

Trade Notes.

Acid, Corrosion, and Rust Resisting Vessels.

An attractive leaflet illustrating a selection of products in steel alloys has reached us from Messrs. Ashmore, Benson, Pease, & Co., Ltd., of Stockton-on-Tees. The leaflet will be of particular interest to the chemical and allied trades.

Contracts Advertised To-Day.

Coal.

The Haverhill (Suffolk) Gas Department invite tenders for the supply of gas coal. [Advert. on p. 962.]

The Gas Department of the Cowes Urban District Council invite tenders for the supply of coal. [Advert. on p. 962.]

Gasholder Repairs.

The Edinburgh Corporation invite tenders for the examination and repair of district gasholders. [Advert. on p. 962.]

Gas Acts (1920 and 1929) Orders.

SPECIAL ORDERS.

Gloucester Gas Light Company.

To authorize the Company to use scheduled lands for gas purposes, and to adapt lands belonging to them as recreation grounds for their employees.

Newquay (Cornwall) Gas Company, Ltd.

To extend the limits of supply, and to empower the Company to raise additional capital and to use scheduled lands for gas purposes.

INCREASED BORROWING POWERS.

Mablethorpe and Sutton Gas Company, Ltd.

To increase the borrowing powers from one-half to three-quarters of the issued share capital for the time being of the Company.

ALTERATIONS OF DECLARED CALORIFIC VALUE.

Walton-on-Thames and Weybridge Gas Company.—470 B.Th.U., in substitution for 450 B.Th.U. (Oct. 1.)

Wandsworth, Wimbledon, and Epsom District Gas Company.—500 B.Th.U., in substitution for 470 B.Th.U. (Oct. 1.)

STOCK AND SHARE LIST.

[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. June 19.	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 5	5	5	Aldershot 5 p.c. max. C. ...	77—82	...	...
522,992	,,	,,	4	4	Do. 4 p.c. Pref. ...	75—80	...	...
1,551,868	,,	Apl. 9	7⅞	7⅞	Alliance & Dublin Ord. ...	102—107	...	105—105½
374,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb. ...	72—77	...	...
522,655	,,	Mar. 5	7	7	Barnet Ord. 7 p.c.	124—129	...	...
300,000	1	Apl. 23	1/4½	1/9⅜	Bombay, Ltd.	16/6—18/6	...	18/-
174,500	10	Mar. 5	9	9	Bournemouth 5 p.c.	15—16	...	...
500,050	10	,,	7	7	Do. B 7 p.c. ...	12½—13½	...	...
439,160	10	,,	6	6	Do. Pref. 6 p.c. ...	11½—11¾	...	11½
50,000	Stk.	Dec. 18	3	3	Do. 3 p.c. Deb. ...	60—63	...	...
162,025	,,	,,	4	4	Do. 4 p.c. Deb. ...	81—84	...	...
357,900	,,	Mar. 19	7½	7½	Brighton & Hove 6 p.c. Con.	112—117	...	...
371,880	,,	,,	6¾	6¾	Do. 5 p.c. Con.	104—107	...	106½
1,287,500	,,	Feb. 19	5	5	Bristol 5 p.c. max.	95—96*a*	...	...
120,420	,,	Dec. 18	4	4	Do. 1st 4 p.c. Deb. ...	78—80*a*	...	...
217,870	,,	,,	4	4	Do. 2nd 4 p.c. Deb. ...	78—80*a*	...	...
328,790	,,	,,	5	5	Do. 5 p.c. Deb.	99½—100½*a*	...	...
855,000	,,	Apl. 9	7	8	British Ord.	110—115	...	...
100,000	,,	Dec. 18	7	7	Do. 7 p.c. Pref.	110—115	...	...
130,000	,,	,,	4	4	Do. 4 p.c. Red. Deb. ...	74—77	...	...
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	92—97	...	...
160,000	,,	Jan. 8	5	5	Cambridge 5 p.c. Deb. ...	95—98	...	...
100,000	10	May 21	6	8	Cape Town, Ltd.	9—10	...	...
100,000	10	May 7	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7½	...	...
150,000	Stk.	Dec. 18	4½	4½	Do. 4½ p.c. Deb. ...	72—77	...	...
626,860	,,	Feb. 19	6	6	Cardiff Con. Ord.	96—99	...	...
237,860	,,	Jan. 8	7½	7½	Do. 7½ p.c. Red. Deb. ...	97—100	...	...
157,150	,,	Feb. 19	5	6½	Chester 5 p.c. Ord.	85—90*b*	...	...
98,936	1	May 7	†2/-	†2/-	Colombo, Ltd. Ord.... ...	28/—33/-	...	28/6—29/-
24,500	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	17/6—19/6	...	17/6—18/-
609,204	1	Apl. 9	1/4½	15·27*d*	Colonial Gas Assn. Ltd. Ord.	16/—18/-	...	...
296,053	1	,,	1/7½	17·67*d*	Do. 8 p.c. Pref.	17/6—19/6	...	...
2,078,380	Stk.	Feb. 19	6	6	Commercial Ord.	94—97	+1	95½—95⅞
475,000	,,	June 11	3	3	Do. 3 p.c. Deb. ...	56—59*	...	...
787,560	,,	Feb. 19	7	7	Croydon sliding scale ...	108—111	...	109½—111
453,100	,,	,,	5	5	Do. max. div.	82—85	...	...
542,270	,,	Mar. 5	7	10	Derby Con.	120—123*c*	...	...
55,000	,,	Dec. 18	4	4	Do. Deb.	65—70*c*	...	...
209,000	,,	Mar. 5	5	5	East Hull Ord. 5 p.c. ...	72—75	...	...
1,002,180	,,	Mar. 19	†4	†6½	European, Ltd.	85—95	...	87½
18,953,033	,,	Feb. 19	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	18/9—19/9/	...	18/10½—19/3
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	64—67	...	66—67
4,294,691	,,	,,	4	4	Do. 4 p.c. Con. Pref. ...	78—81	...	...
5,694,095	,,	June 11	3	3	Do. 3 p.c. Con. Deb. ...	61—64*	...	62⅝—63½
3,642,770	,,	,,	5	5	Do. 5 p.c. Red. Deb. ...	99—102*	...	101½—102
2,500,000	,,	,,	—	—	Do. 4½ p.c. Red. Deb. ...	95—98*	...	96½—98⅜
161,480	,,	Mar. 5	10	10	Harrogate Cons. 10 p.c. max.	158—163	...	...
82,500	,,	Mar. 19	7	7	Hastings & St. L. 5 p.c. Conv.	98—103	...	101⅛—102
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	82—85	...	...
70,000	10	Oct. 9	§	10	Hongkong & China, Ltd. ...	13—14	...	...
213,200	Stk.	Mar. 5	6	6	Hornsey Con. 3½ p.c. ...	91—94	...	...
2,800,000	,,	May 21	15	25	Imperial Continental Cap.	315—325	−5	317—329
223,130	,,	Feb. 5	3½	3½	Do. 3½ p.c. Red. Deb.	78—83	...	...
285,242	,,	Mar. 5	8½	8½	Lea Bridge 5 p.c. Ord. ...	127—130	...	...
2,145,907	,,	Feb. 19	6	6	Liverpool 5 p.c. Ord. ...	99½—100¾*b*	−¼	...
600,000	,,	Mar. 19	7	7	Do. 7 p.c. Red. Pref.	98½—100¼*b*	...	...
165,736	,,	Feb. 19	9	9	Maidstone 5 p.c. Cap. ...	128—133	...	...
63,480	,,	Dec. 18	3	3	Do. 3 p.c. Deb. ...	54—57	...	...
75,000	5	June 11	†10	†10	Malta & Mediterranean ...	5⅞—6¼*	...	...
392,000	—	Apl. 2	5½	5½	Metropolitan (of Melbourne) 5½ p.c. Red. Deb.	86—89	...	...
675,000	Stk.	May 21	†6	†6	Montevideo, Ltd.	90—100	...	...
2,061,315	,,	Mar. 5	5	5½	Newcastle & Gateshead Con.	15/9—16/6*d*/	−/4½	...
682,856	,,	,,	4	4	Do. 4 p.c. Pref. ...	75—77*d*	...	...
691,705	,,	Jan. 8	3½	3½	Do. 3½ p.c. Deb. ...	69½—70½*d*	...	...
277,285	,,	May 7	5	5	Do. 5 p.c. Red. Deb.	98—100*d*	...	...
199,940	,,	Mar. 5	7½	7½	North Middlesex 6 p.c. Con.	115—120	...	...
396,160	,,	Feb. 5	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	,,	Apl. 23	9	7	Oriental, Ltd.	100—105	...	...
69,000	5	13 May, '15	—	—	Ottoman	0—½	...	...
205,162	Stk.	Dec. 18	8	8	Plym'th & Stonehouse 5 p.c.	110—115	...	...
424,416	,,	Feb. 19	8	8	Portsm'th Con.Stk. 4 p.c.Std.	122—127	...	125
241,446	,,	,,	5	5	Do. 5 p.c. max. ...	78—81	...	...
686,312	,,	Jan. 22	4	4	Primitiva 4 p.c. Rd. Db. 1911	85—88	...	...
389,813	,,	Dec. 18	4	4	Do. 4 p.c. Cons. Deb.	85—88	...	86¼—87½
150,000	10	Apl. 9	6	6	San Paulo 6 p.c. Pref. ...	8—8½	...	...
1,736,968	Stk.	Mar. 19	6½	6½	Sheffield Cons.	105—107*e*	...	...
95,000	,,	Jan. 8	4	4	Do. 4 p.c. Deb.	79—81*e*	...	...
90,000	10	June 11	‡5	‡5	South African	3¼—5¾*	...	...
6,709,895	Stk.	Feb. 5	5	7½	South Met. Ord.	102½—104½	...	102¾—103⅜
1,135,812	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	113—116	...	...
1,895,445	,,	Jan. 8	3	3	Do. 3 p.c. Deb. ...	61—64	...	...
784,000	,,	Mar. 5	6¼	6¼	Do. 6¼ p.c. Red. Db.	98—100	...	...
1,000,000	,,	Jan. 22	—	4	Do. 5 p.c. Red. Deb.	101—104	+1	103—103⅜
91,500	,,	Mar. 5	8½	8½	South Shields Con.	114—116*d*	...	...
1,543,795	,,	Feb. 19	6¼	6¼	South Suburban Ord. 5 p.c.	102—105	...	104—105
668,837	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	101—104	...	...
647,740	,,	Feb. 19	5	5	Southampt'n Ord. 5 p.c. max.	77—80	..	...
121,275	,,	Dec. 18	4	4	Do. 4 p.c. Deb.	75—78	...	...
179,014	,,	Mar. 5	8	8	Sutton Ord.	120—130	...	...
94,500	,,	Jan. 8	5	5	Do. 5 p.c. Deb.	96—99	...	...
250,000	,,	Mar. 5	7	7	Swansea 7 p.c. Red. Pref. ...	96—99	...	...
200,000	,,	Dec. 18	6½	6½	Do. 6½ p.c. Red. Deb.	100—103	...	...
1,076,490	,,	Mar. 5	6⅝	6⅝	Tottenham District Ord. ...	102—106	..	...
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref. ...	101—104	...	...
199,005	,,	June 11	4	4	Do. 4 p.c. Deb. ...	75—78*	...	...
85,701	,,	Mar. 19	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	74—79	...	...
310,694	,,	Mar. 5	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	...
86,330	,,	,,	5	5	Do. 5 p.c. Pref. ...	88—93	...	...
1,322,220	,,	Mar. 5	7	7	Wandsworth, Wimbledon, and Epsom Cons. ...	113—116	...	...
426,000	,,	,,	5	5	Do. 5 p.c. Pref.	97—100	...	99¼
1,013,464	,,	Dec. 18	5	5	Do. 5 p.c. Deb.	100—103	...	102½—102⅝

Quotations at:—*a*.—Bristol. *b*.—Liverpool. *c*.—Nottingham. *d*.—Newcastle. *e*.—Sheffield. *f*.—The quotation is per £1 of stock. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. = 10 p.ct. p.a. less tax and less tax on interim dividend.

(This announcement is inserted gratuitously.)

PETER—WITH ONE EXCEPTION

With one exception Peter is an ordinary little fellow. Chubby, likeable, just five-and-a-half, full of life and fun and on occasions—be it admitted—of naughtiness.

Just now Peter's rather important, for this is his first term at school, and he's grappling with the intricacies of "A B C" and "Twice Two": difficult subjects to all men of five-and-a-half, but even more difficult in Peter's case because—bad luck—he's totally blind. That's his One Exception.

Peter learns reading, writing, and 'rithmetic through the medium of "Braille"—dull stuff compared with the coloured picture books of most five-and-a-halfs. However, he's a stout lad is Peter, and he's making great progress.

Would you like to know more about him? How, in spite of his "One Exception," he is being educated, and, when older, technically trained and usefully employed.

There is a long waiting list of "Peters" throughout the British Isles, for whom training and accommodation must be provided in the immediate future.

Will you help with a donation or annual subscription? Any sum, large or small, will be gratefully received.

Here's a suggestion. Your eyesight is worth 3d. a year to you. Send Peter and his handicapped pals 3d. for every year you've had it. Now, please, in case it slips your memory. Good idea!

THE CHAIRMAN,

SCHOOL FOR THE BLIND

(Founded 1838),

Swiss Cottage, LONDON, N.W.3

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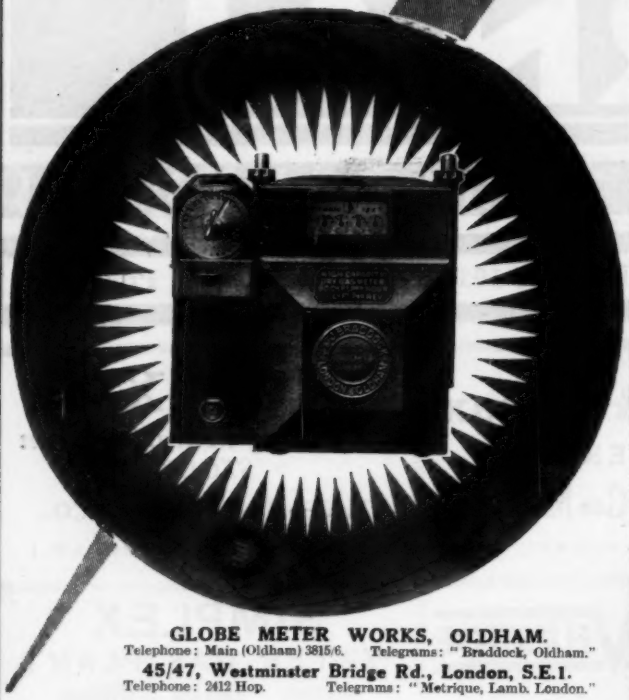

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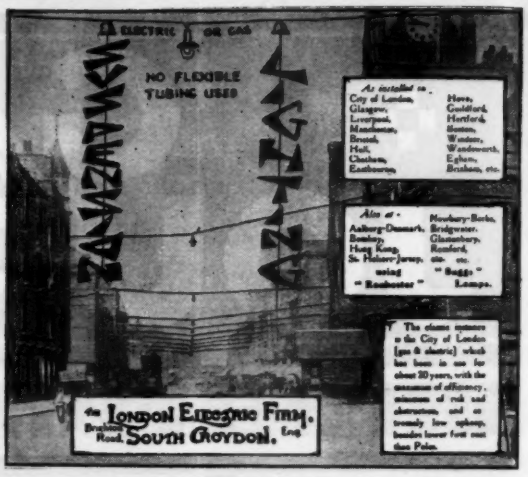
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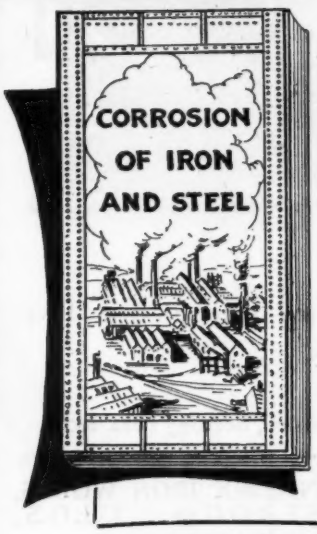
Vol. 194. 83rd Year. LONDON, JUNE 24, 1931. No. 3553. Price 1s.



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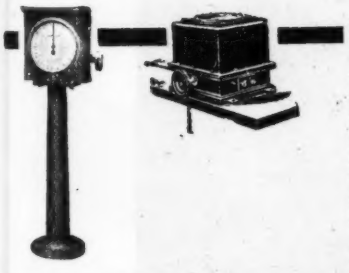

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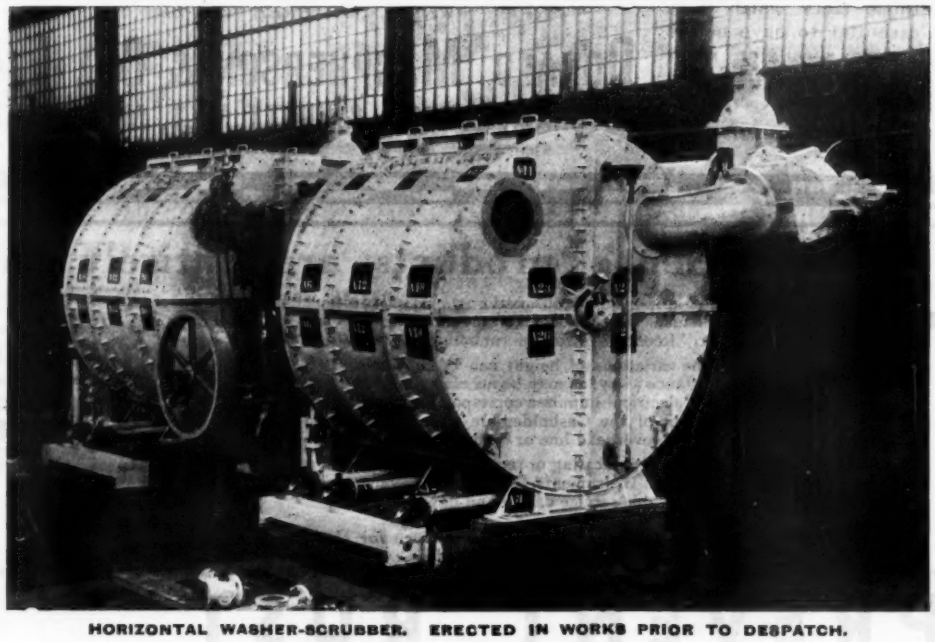

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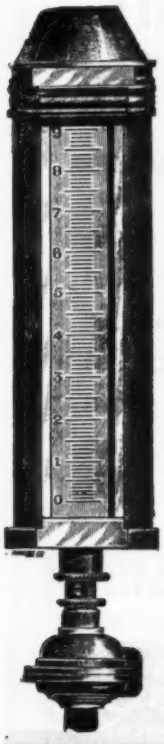

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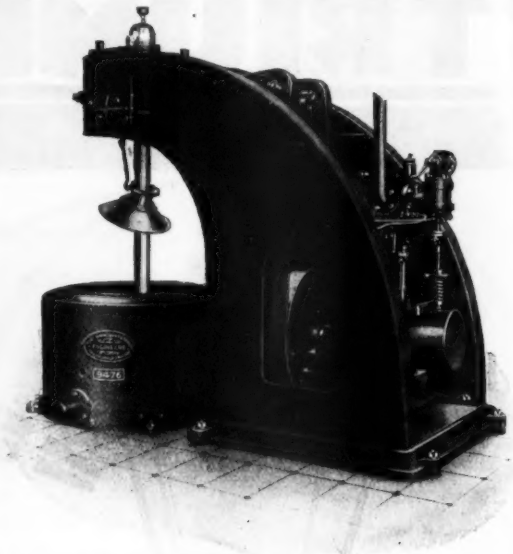

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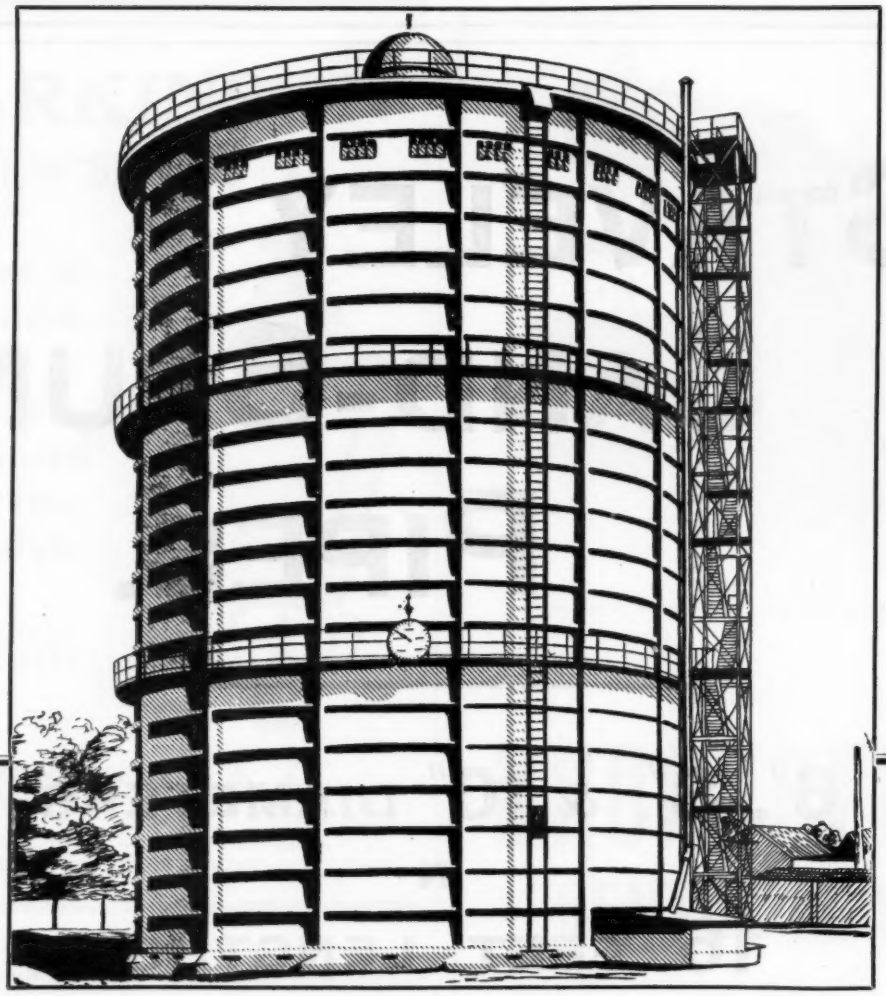

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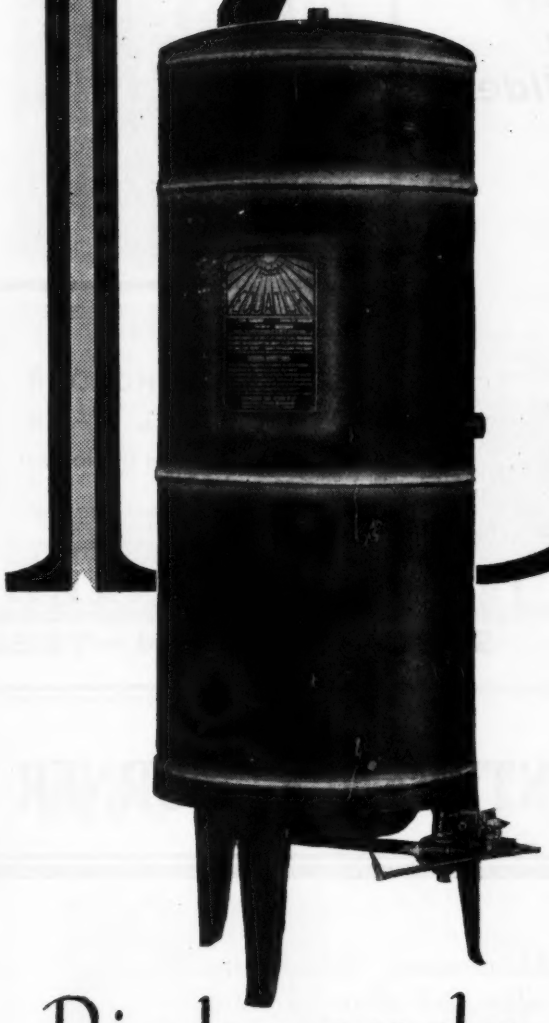

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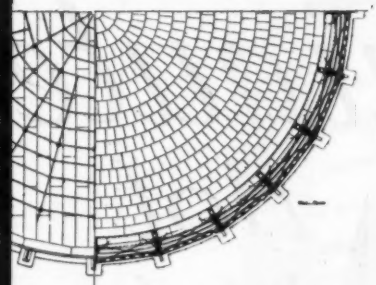

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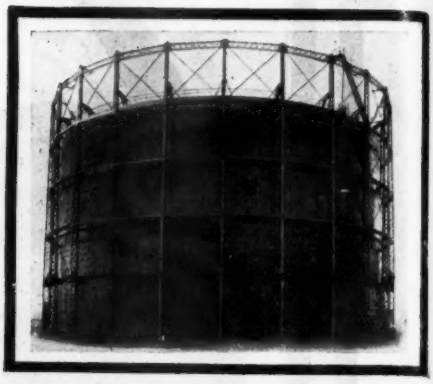

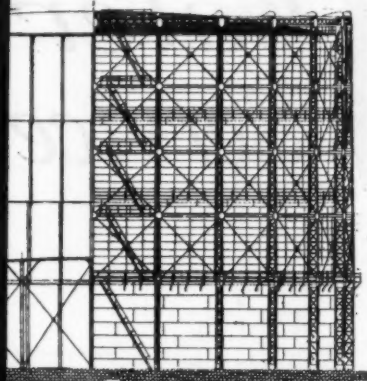

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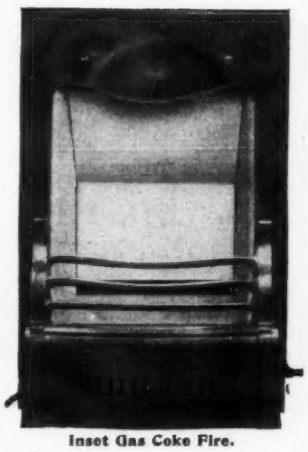

Inset Gas Coke Fire.

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Kempton's "Kaye" Domestic Coke Grates, with **gas ignition**, will help your coke sales to keep pace with output.

Sell them through your Showrooms.

If ordered now, can be fitted without any delay.

1. Gas ignited by patent reversible bar burner for left or right hand supply.
2. A glowing fire which will burn for 2 or 3 hours without attention.
3. **A draught regulator controls rate of fuel consumption.**
4. A rocking bar (in place of ordinary poker) eliminates waste.
5. Low fuel cost.

Inset Gas Coke Fire.

C. H. KEMPTON & Co. LTD.
Stangate House,
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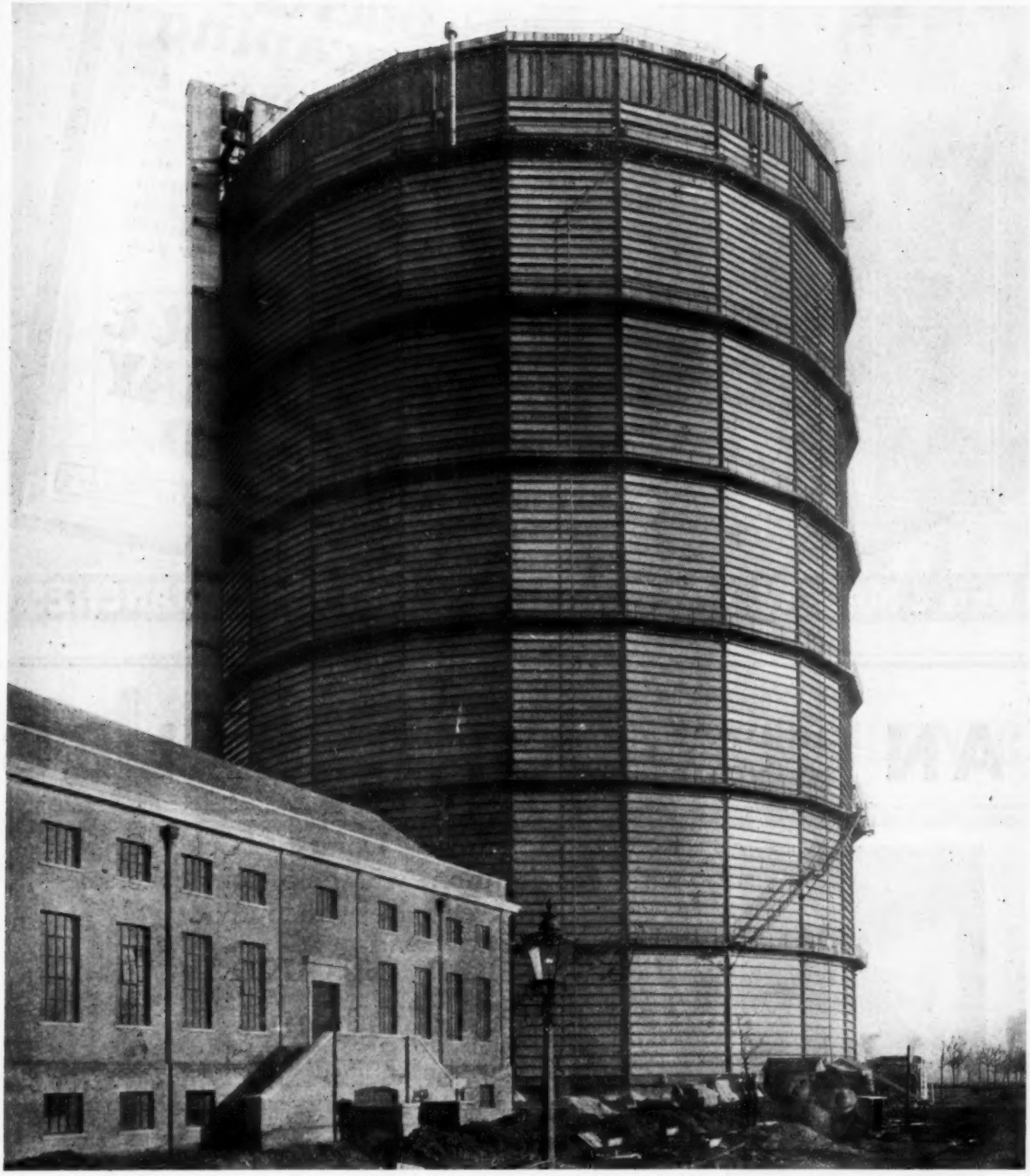
Telephones: Hop 3743, 5535. *Telegrams:* Kemptomant, London.

WATERLESS GASHOLDERS

(M.A.N. PATENTS)



THE LARGEST WATERLESS GASHOLDER IN THE BRITISH ISLES OR COLONIES
8 MILLION C.FT. CAPACITY ERECTED at SOUTHALL for the GAS LIGHT & COKE CO.

LICENSED CONTRACTORS:—

R. & J. DEMPSTER, LTD. - Manchester **CLAYTON, SON & CO., LTD. - - - Leeds**
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BRITISH EMPIRE LICENSEES:—

WATERLESS GASHOLDER CO., LTD.

13, ROOD LANE, LONDON, E.C.3

Telegrams: "Boutillier, Bilgate, London." *Telephones: Royal 8611-4.*

PREVENT RUST

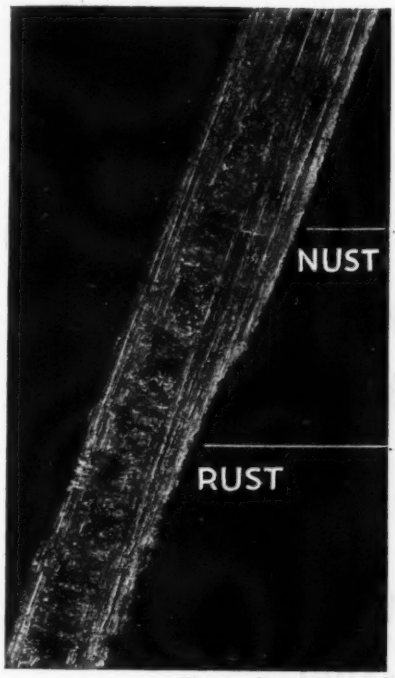


Illustration shows actual photograph of section magnified 20 diam.

A SEVERE TEST

"A single coating of NUST is a permanent preventative of corrosion!"

This illustration shows one of a number of pieces of sheet steel on which most conclusive tests were carried out.

Half of their area was coated with NUST in the ordinary way, and they were then exposed to the following conditions for a period of years:—

(1) Partial immersion in ordinary London tap water.

(2) Exposure to London atmosphere.

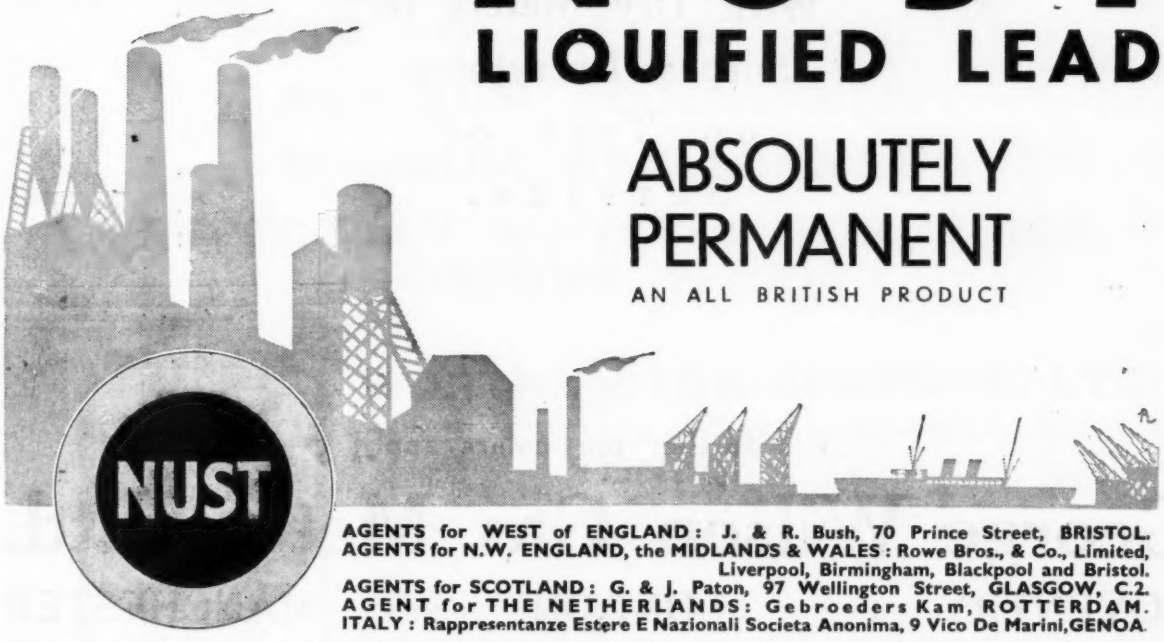
(3) Exposure to strongly corrosive moist atmosphere in which large quantities of both nitric and hydrochloric acid were present.

To all these rigorous tests the NUST coated sections of the metal showed entire imperviousness, whilst the extent of corrosion on the unpainted halves (shown clearly in the photograph) was strong evidence of their severity.

(These tests were carried out by Messrs. Riley, Harbord & Law, Consulting Metallurgists & Chemists, of 16, Victoria Street, S.W.1., a copy of whose report will be sent on application).

GUARANTEE. The Manufacturers undertake to give a written guarantee for NUST against atmospheric corrosion.

USE NUST
LIQUIFIED LEAD



ABSOLUTELY PERMANENT

AN ALL BRITISH PRODUCT

AGENTS for WEST of ENGLAND: J. & R. Bush, 70 Prince Street, BRISTOL.
AGENTS for N.W. ENGLAND, the MIDLANDS & WALES: Rowe Bros., & Co., Limited, Liverpool, Birmingham, Blackpool and Bristol.
AGENTS for SCOTLAND: G. & J. Paton, 97 Wellington Street, GLASGOW, C.2.
AGENT for THE NETHERLANDS: Gebroeders Kam, ROTTERDAM.
ITALY: Rappresentanze Estere E Nazionali Societa Anonima, 9 Vico De Marini, GENOA.

Nor-Rust Liquid Lead Co., Ltd., Dept. T, Iddesleigh House, Caxton Street, London, S.W. 1

SERVICE!

The Safest and Surest Way to Progress is to Give Satisfaction. State Your Requirements— We Can Supply You With Dry Meters to Surpass Everything on Test or Service.

For further particulars apply

George Wilson Gas Meters Ltd.

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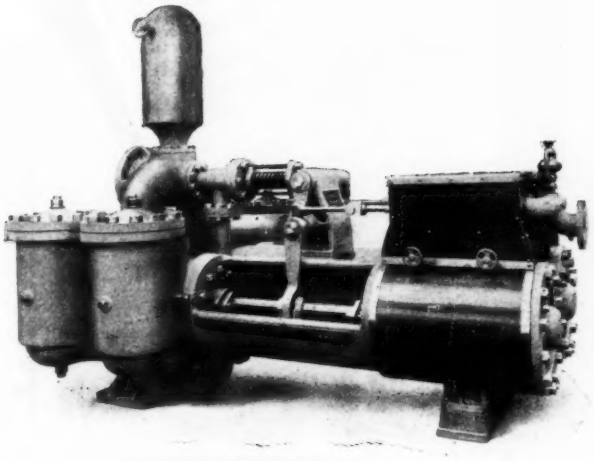
Head Office - - - - Foleshill Road, Coventry

WORTHINGTON

OIL PUMPS



WORTHINGTON
HORIZONTAL DUPLEX OIL PUMP
WITH BALL VALVES

Stand for

Strength
Power
Efficiency
Economy

under severest conditions

IMPROVED DESIGN AND STURDY BUILD

EXTRA PRESSURE WITHOUT EXTRA WEIGHT

HIGH VOLUMETRIC EFFICIENCY

MAXIMUM ACCESSIBILITY

MINIMUM REPLACEMENT

ESPECIALLY SUITABLE FOR THICK, VISCOUS FLUIDS

WORTHINGTON

PUMPS
Centrifugal, Steam and Power
COMPRESSORS
VACUUM PUMPS
SEWAGE PUMPS
PUMPING ENGINES
OIL ENGINES
for Marine and Land Service
GAS ENGINES
CONDENSERS
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FEED WATER HEATERS
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METERS

Literature on request.

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CABLES AND TELEGRAMS: "PUMPING, WESTCENT, LONDON"

WORKS: NEWARK-ON-TRENT.

W.S. 149

Branches, Offices, and Representatives :

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LIVERPOOL—Drury Bldgs., 21, Water Street.
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Also at all principal cities throughout the world.

PROGAS means PROGRESS!

The PROGAS System of Gas Distribution marks a striking advance

See demonstration in Company's Laboratory, or write for illustrated booklet to:—

PROGAS

THE PROGAS CO. - - LTD.
95 BELGRAVE ROAD
VICTORIA - - S.W.1

Telephone: Victoria 6778
Telegrams: "Gasgoverna, Churton, London"
Cables: "Gasgoverna."

BETTER BE SAFE THAN SORRY

When the damage is done it is too late to repent. Far wiser to safeguard your plant against excessive wear and tear and breakdowns resulting from faulty lubrication by using always the best that can be had.

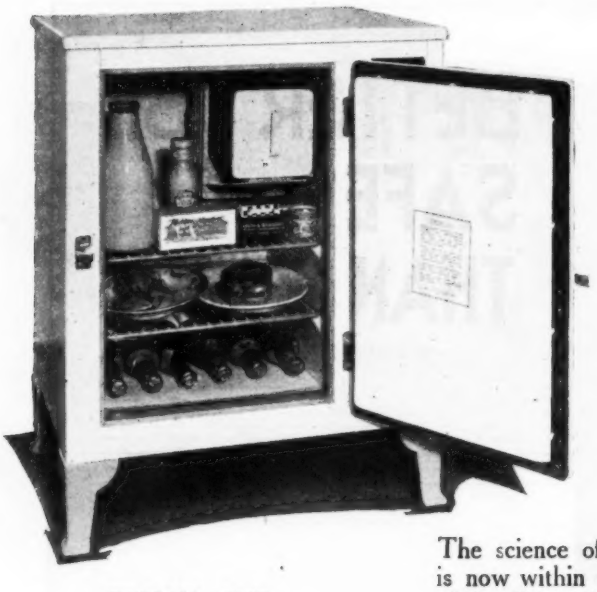
Duckham's

OILS & GREASES

FOR BETTER LUBRICATION

ALEXANDER DUCKHAM & CO., LTD., DUCKHAM HOUSE, 16, CANNON STREET, E.C. 4

REFRIGERATION FOR THE MILLION!



OVERALL SIZE
3 ft. $\frac{1}{2}$ in. × 1 ft. $8\frac{3}{8}$ in. × 2 ft. $2\frac{3}{4}$ in.
Internal capacity 3·2 cubic ft.

The British-made "Freezolux" is *different* from other refrigerators. It has no mechanism—a small gas flame takes the place of the usual machinery. It is automatic, reliable, and large enough for the average family.

A tiny gas flame replaces all moving parts.

A Revolutionary plan for increasing the sale of gas on a LARGE scale

The science of Domestic Refrigeration has been revolutionised. It is now within easy reach of the million. Practically every member of the General Public who uses gas can now own a refrigerator.

This has been brought about by the introduction of the British-made "Freezolux" Gas-operated Refrigerator—the simplest, most compact and *lowest-priced refrigerator on the market.*

Due to its reasonable cost the "Freezolux" can be supplied to consumers of limited incomes at terms they can well afford.

Owing to the outstanding merits and the benefits consumers will derive from its use the "Freezolux" Gas-operated Refrigerator will, in time, be as popular as the Gas Cooker.

The opportunities for new business for Gas Undertakings are enormous. It is going to be a most valuable additional load; not only during the summer when the demand for gas is light, but throughout the whole year.

Our intention is to co-operate wholeheartedly with the Gas Industry to further the sales of the British-made "Freezolux" Gas-operated Refrigerator. Link up with us at the outset. Full particulars will be sent on request.

ELECTROLUX LTD.
153/155, Regent Street, London, W. 1.
***Works:* Luton, BEDS.**

BY APPOINTMENT

FREEZOLUX

Gas-operated REFRIGERATOR

E.I.H.

for HOTELS AND CANTEENS

The Fletcher
NEW WORLD
GAS COOKER

This Fletcher Cooker has one large capacity oven with double doors and other unique constructional features, all designed specially to meet the requirements of large scale cooking on the most modern lines. The "Regulo" oven-heat control ensures economy of working and enables a considerable saving of the time of the staff to be effected during the busiest hours. Supplied in black or in "Rado" Porcelain Mottled Enamel as illustrated below.

Particulars on application

FLETCHER, RUSSELL & Co., Ltd.
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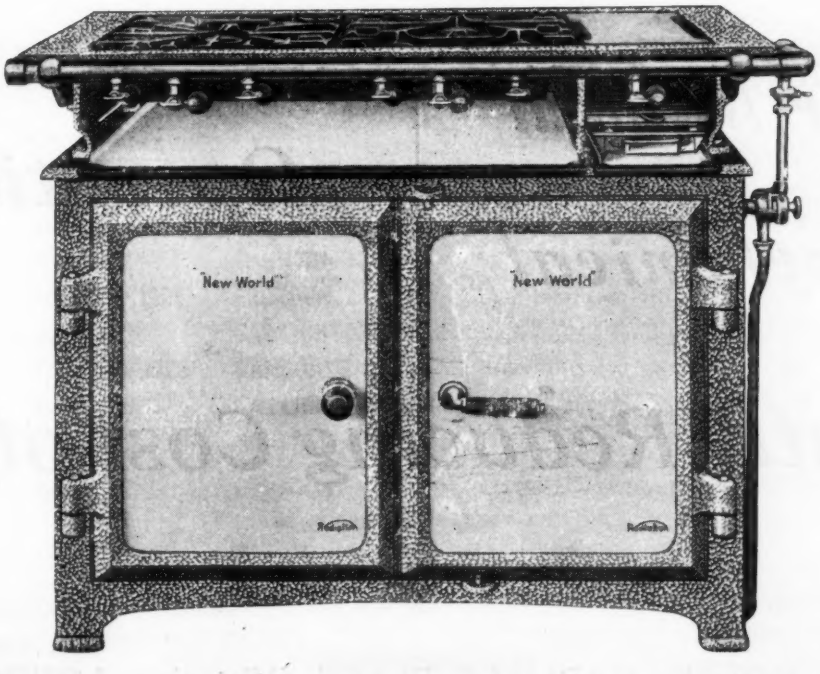
(RADIATION LTD., Proprietors)



HUMPHREYS & GLASGOW LTD.

BLUE
and
CARBURETTED

WATER-GAS

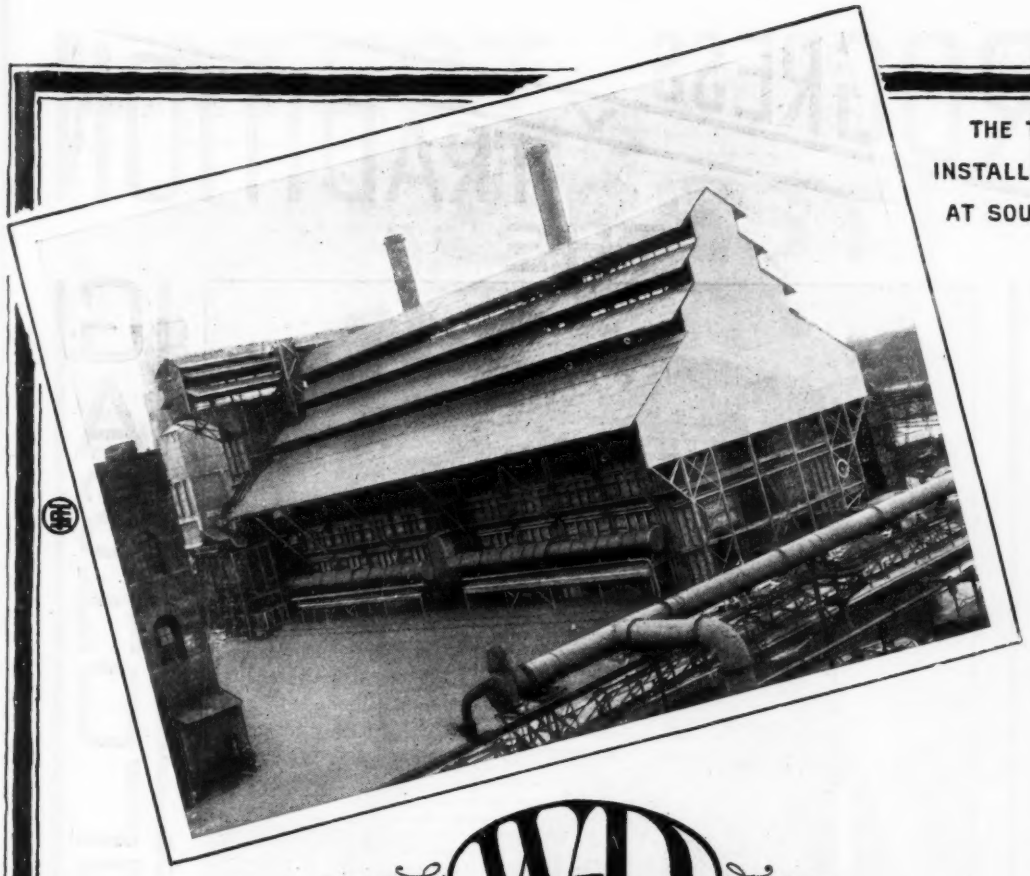
Perfected Plants & Processes

Using Either Coke or Coal

For Manual or Mechanical } *Operation*

Greatly Reducing Cost of Gas

HUMGLAS HOUSE, CARLISLE PLACE (Victoria), LONDON, S.W.1.



THE TWO INSTALLATIONS AT SOUTHALL.

INTERMITTENT VERTICAL CHAMBERS

PLANTS BUILT BY

THE WOODALL-DUCKHAM COMPANY

ORDER PLACED			CAPACITY TONS PER DAY
JULY, 1925	RAMSGATE	(1ST INSTALLATION)	68
JANUARY, 1927	GLASGOW (DAWSHOLM)		230
MAY, 1927	TAUNTON		24
FEBRUARY, 1928	CROYDON	(1ST INSTALLATION)	230
JUNE, 1928	GAS LIGHT & COKE Co.	(SOUTHALL STATION) (1ST INSTALLATION)	300
FEBRUARY, 1929	RAMSGATE	(2ND INSTALLATION)	40
MARCH, 1930	GAS LIGHT & COKE Co.	(SOUTHALL STATION) (2ND INSTALLATION)	300 *
NOVEMBER, 1930	SOUTHAMPTON		180 *
MARCH, 1931	CROYDON	(2ND INSTALLATION)	230 *

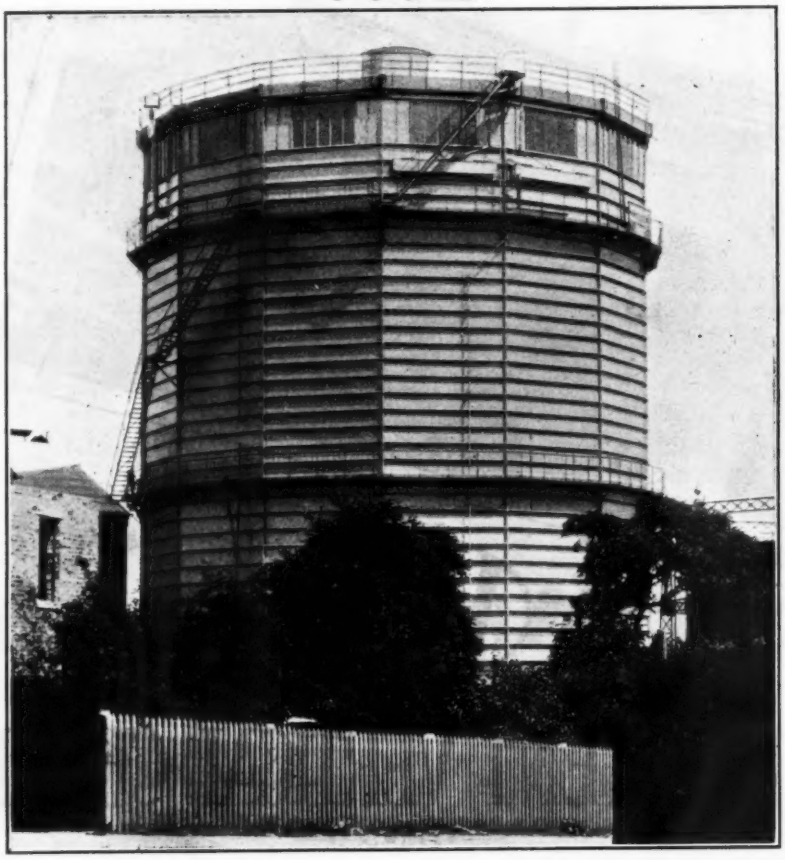
* IN COURSE OF ERECTION.

THE WOODALL-DUCKHAM VERTICAL RETORT AND OVEN CONSTRUCTION Co. (1920) LTD.

ALLINGTON HOUSE, 136-150, VICTORIA STREET, LONDON. S.W.1.

PROGRESS v TRADITION

THE WATERLESS GASHOLDER



ADVANTAGES

1. DRIER GAS.
2. PRACTICALLY UNIFORM PRESSURE.
3. ELEVATED FOUNDATIONS EFFECT UTILIZATION OF GROUND SPACE.
4. REDUCED PAINTING COSTS.

PROGRESS v TRADITION

When George Stephenson proposed the improvement of locomotion by the application of steam in 1810, he was derisively opposed. His opponents said "the old way is better." All progressive achievements have been attained in face of this British conservatism. The Englishman's trait forbids him to accept an invention until its advantages have been indisputably demonstated. So the history of the inception of the "Waterless" corresponds with the traditions of the past, but like all great inventions, it has eventually triumphed over this conservatism and become an essential part of Modern Gas Plants.

WILL YOU FAVOUR US WITH YOUR ENQUIRIES?

ADVANTAGES

5. NO WORRY DURING FROSTY PERIODS.
6. ENHANCES THE APPEARANCE OF YOUR WORKS.
7. ALL WORKING PARTS ACCESSIBLE.
8. A POSITIVE SEAL, AUTOMATICALLY MAINTAINED.

ROBERT DEMPSTER & SONS LTD.

Wire: "DEMPSTER" ELLAND

ELLAND

'Phone: ELLAND 261

LATEST & BEST!

PRE-EMINENT PARKINSON FOR EFFICIENCY

THE Parkinson HOT SPRING Storage Heater is the most up-to-date solution of the problem of obtaining continuous hot water supply for domestic and other purposes. It is entirely automatic in operation, and has a rated capacity of 20 gallons. Its normal maximum gas consumption is approximately 10 cubic feet per hour, which is automatically reduced to from 1½ to 2 cubic feet per hour when the water reaches the predetermined temperature. Moreover, some 4½ gallons of water at 135-140 deg. Fahr. are available after one hour's heating up.

The HOT SPRING is a neat cylindrical apparatus, with no awkward projections, and is convenient to install. The internal heating unit can easily be withdrawn for inspection, and in the event of the gas flame being accidentally extinguished, the gas supply is automatically cut off. A capacity gauge indicates at a glance the quantity of hot water available.

The HOT SPRING Heater solves the hot water problem —write to us for particulars.

THE PARKINSON STOVE CO., LTD.
STECHFORD **BIRMINGHAM**

London Showrooms:
8 & 10, Grosvenor Gardens,
Victoria, S.W. 1.

And at Manchester,
Glasgow, Belfast, Dublin,
and Wellington, N.Z.

THE PARKINSON STOVE CO. (AUSTRALIA) LTD.,
Melbourne, Sydney, and Perth, W.A.

The illustration shows the HOT SPRING Storage Heater with cover in position. The Heater is cylindrical with no awkward projections.

THE PARKINSON HOT SPRING STORAGE WATER HEATER

RELIABLE - - - EFFICIENT - - - ECONOMICAL

NEW WORLD
NEW WORLD

THERMOSTAT USEFULNESS!

THE "New World" Regulo-controlled Cooker does difficult things — and does them well. . . .

Because of its exclusive feature of an additional low-temperature cooking zone in the oven, it has the exclusive advantage of the ability to cook the whole dinner simultaneously, at one "Regulo" Setting, entirely without attention.

Here is a typical Six-Course Dinner which can be prepared in the No. 66 and larger sizes of the "New World" Regulo-Controlled Oven :—

TOMATO SOUP, HALIBUT, BRAISED SWEETBREADS, CHICKEN AND BREAD SAUCE, PEAS AND POTATOES, FRUIT CARAMEL PUDDING, MACARONI.

"Regulo" Setting Mark 7. Time 1 hour 15 minutes.

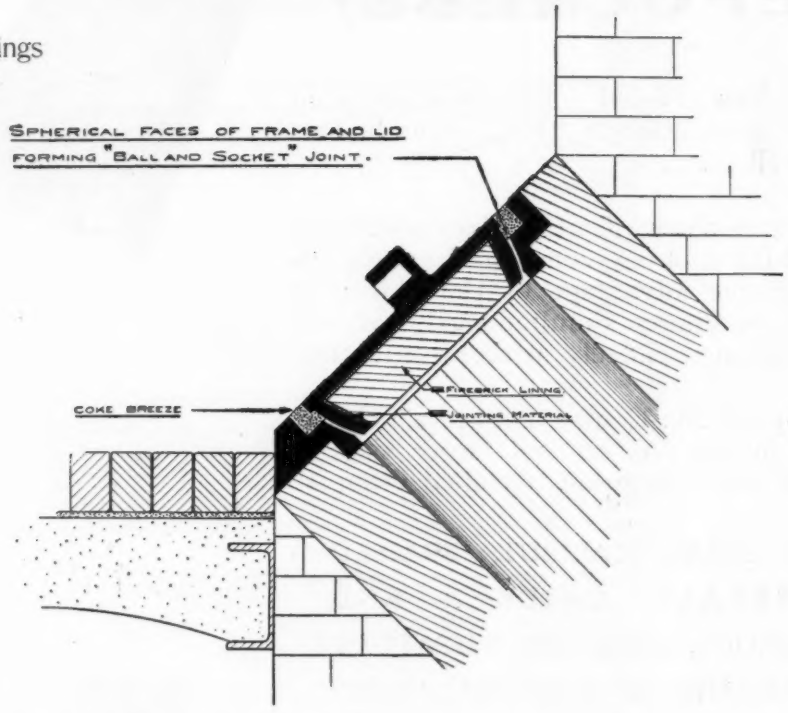
The whole dinner is placed in the hot oven, is cooked without any attention, and is withdrawn at the end of the specified time ready for serving. Sweets, etc., not wanted at once merely require to be kept warm in the oven, employing the "Regulo" at mark $\frac{1}{4}$ setting.

Radiation
LIMITED

The "Sunderland" Patent Dual Seal Feeding Frame and Lid

(Drury's and Fall's Patent)

The Sweepings Seal it.



THE CONVEX SURFACE of the lid rests in the concave face of the frame and forms what is commonly known as a ball and socket joint. These ball and socket faces ensure a gas-tight joint, whatever the degree of tilt of the lid relative to the frame. This primary seal is augmented by a superimposed cavity into which the fine breeze may be swept from the floor, thus forming a secondary seal. The design of the lid provides the necessary key for maintaining in position the firebrick lining, whether formed of bricks or tiles. The lining takes the brunt of the heat from the producer, so protecting the lid.

WHEN A PRODUCER IS WORKING UNDER PRESSURE, the Dual Seal prevents the highly poisonous carbon monoxide from vitiating the surrounding atmosphere in which the men are working.

WHEN A PRODUCER IS WORKING UNDER VACUUM, the Dual Seal prevents the drawing in of air, which causes a partial combustion of the gas before it enters the setting.

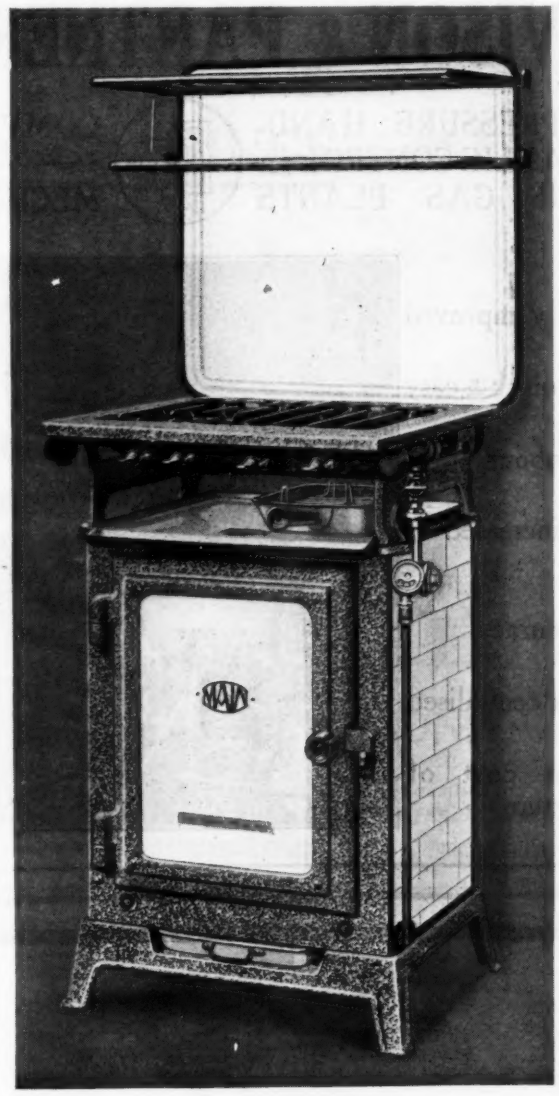
GAS ENGINEERS WILL APPRECIATE THESE ADVANTAGES

The "Sunderland" Patent Dual Seal Feeding Frame and Lid is made from our well-known "Rafrakton" metal. The difference between "Rafrakton" and ordinary metal cannot be too strongly emphasised. "Rafrakton" possesses in a wonderful degree three characteristics which it is most useful to find in combination, viz., toughness, deflection, and endurance.

Drakes Limited
HALIFAX
YORKS

Telephone: 2741 Halifax (Day and Night)
Telegrams: "Drakeled, Halifax"
Special Address for Night Telegrams: "Phone from Leeds, Drakeled, Halifax 2741"

"Rafrakton" castings are clean; they are enduring, for they stand up without distortion to conditions of heat which cause ordinary castings to warp and crack, and they are thus particularly suitable for mouthpieces, feeding frames and doors, clinkering frames and for similar uses and situations.



★

Some Special Reasons

for the popularity of the MAINSERVOR Cooker are ✦ its superior ENAMELLED finish; ✦ its patent CONSERVOR Oven with two burners, famous for its even heating; ✦ its suitability for bread baking on every shelf, even the bottom one; ✦ its distinctive Red dial MAINSTAT Automatic Cooking Control, noted for its accuracy and reliability, and the fact that it is located where it can be easily read; ✦ its exceptionally strong Brasswork; ✦ and its ever-cool Bakelite Door Handle

MAINSERVOR

Cooker in Mottled "B" Mainamel finish

R. & A. MAIN, LIMITED, LONDON AND FALKIRK

DAVISON & PARTNER, LTD.

11, Carteret Street, Westminster, S.W.1

LOW PRESSURE HAND-HYDRAULIC CONTROL for WATER - GAS PLANTS

COMPLETE AUTOMATIC SETS WITH MECHANICAL GRATE & CHARGER

Make greatly improved

Operation quick & easy

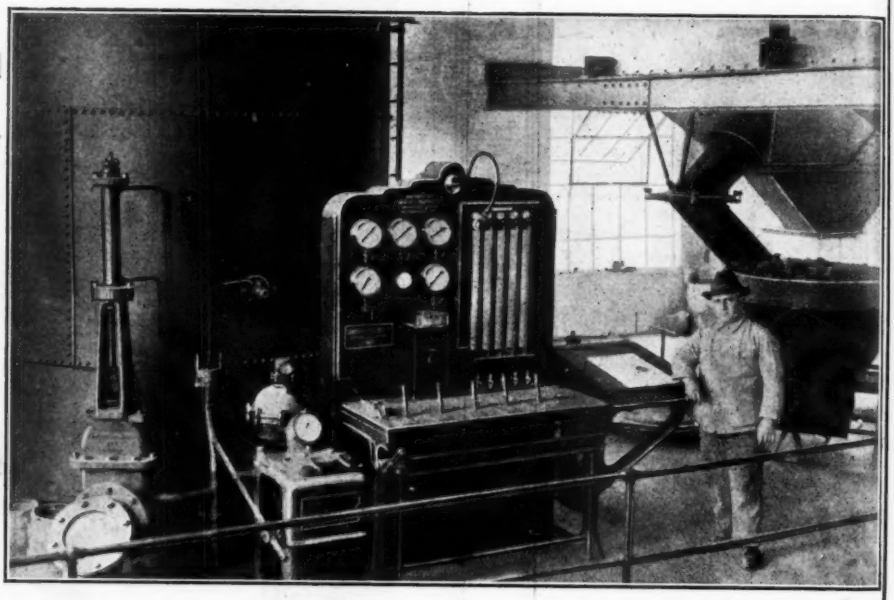
Reduced labour

Efficiency increased

Greater accuracy

All controls centralised

Saving in cost of manufacture



R. & J. DEMPSTER LTD.

have on order or erected

FIFTEEN WATERLESS HOLDERS

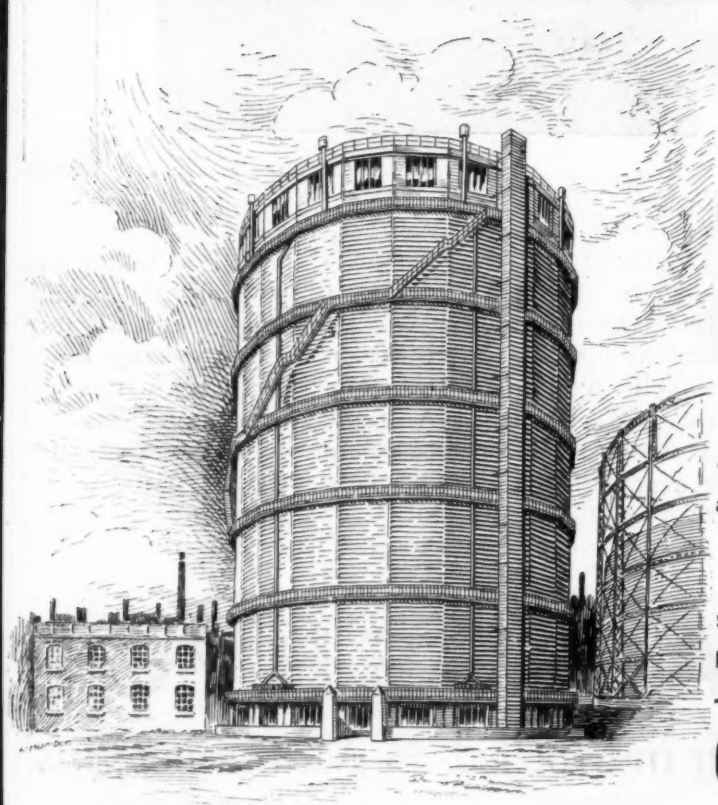
to contain upwards of

FORTY-ONE MILLION

CUBIC FEET OF GAS

These include the LARGEST and SMALLEST in the British Isles and Colonies

SOUTHALL - - 8,000,000
BRIGHTON (Australia) 100,000



Five Million Holder erected at Manchester.

GAS PLANT WORKS MANCHESTER.

THE RADIAL VALVE

has only

TWO BEARINGS

and these pivot.

Compare this with

THE SLIDE

having

THREE

Two of which have longitudinal side thrust.

SMITH METERS LTD.

(ESTABLISHED 1884)

186, KENNINGTON PARK RD., LONDON, S.E. 11.

Telegrams: "SMIETERS LAMB, LONDON." Telephone: RELIANCE 1980 & 2449.

AGENTS FOR AUSTRALIA:
AUSTRALASIAN GAS EQUIPMENT CO., LTD., SYDNEY.

AGENTS FOR NEW ZEALAND:
Messrs. DOUGALL, COOMBS & CO., LTD., WELLINGTON.

AUTOMATIC GAS HEATING

THE "EMPEROR"
(Insulated and Mottle-Enamelled Boiler.)

THE "EMPEROR"
(Insulated and Cellulose-Enamelled Boiler.)

A Potterton Installation, with "**Emperor**" insulated Boiler and a thermal storage, yields an abundant supply of hot water with the greatest flexibility whenever the demand occurs, and at other times, both day and night, maintains the water at a high temperature with a consumption of 1·5 to 2·0 c.ft of gas per hour.

Potterton "EMPIRE" and "EMPEROR" Boilers are supplied on simple hire by the Gas Light & Coke Company.

THOMAS POTTERTON (HEATING ENGINEERS) LTD.

Cavendish Works,

RAVENSWOOD ROAD :: BALHAM :: LONDON, S.W.12

Telephone: STREATHAM 8486-7-8. Telegrams: POTTERTON, BAL, LONDON.

STANTON

DELAVAUD SPUN IRON PIPE

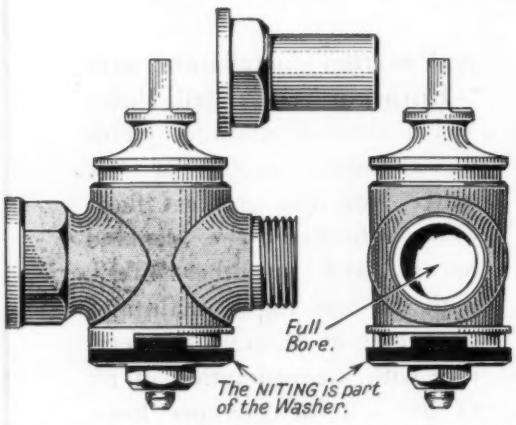
NOW AVAILABLE IN 18 FEET LENGTHS

Quick Delivery of 4 and 6 inch Diameters

THE STANTON IRONWORKS COMPANY LIMITED
NEAR NOTTINGHAM

Don't Hesitate —

SPECIFY WILLEY PRODUCTS



TEE or KEY, GUNMETAL or BRASS.
Heaviest in the Trade at the Price.

A CLEAR FULL-WAY COCK IS A DISTRICT NECESSITY

▫ ▫ ▫

There is something SOLID about the "OFF" position of a WILLEY MAIN COCK because the WASHER is The NITING.

▫ ▫ ▫

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Makers of Everything for Gas
Telephone 4064—65

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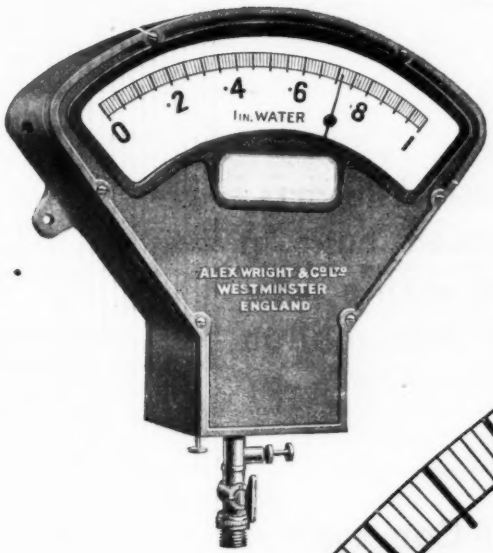
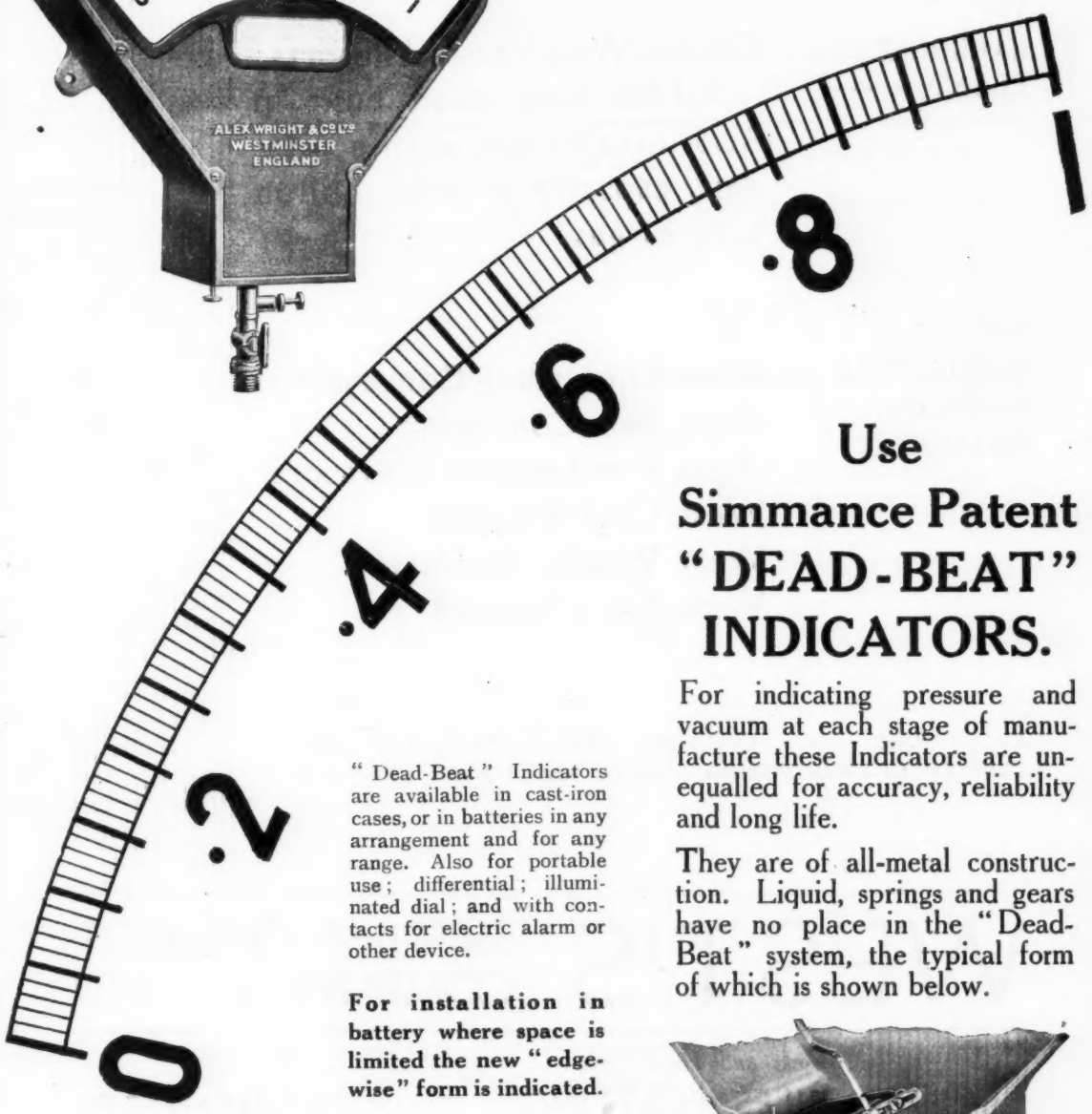
Phone: City 7419
DARLINGTON
Phone: 2586
NEWPORT

Read the Pressure by the Pointer





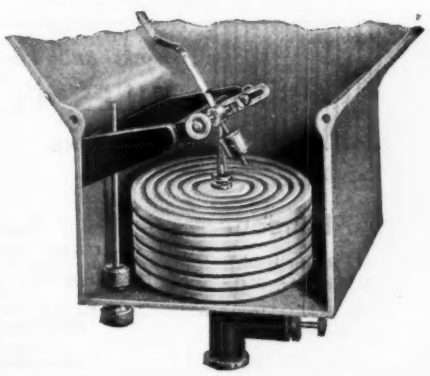
"Dead-Beat" Indicators are available in cast-iron cases, or in batteries in any arrangement and for any range. Also for portable use; differential; illuminated dial; and with contacts for electric alarm or other device.

For installation in battery where space is limited the new "edgewise" form is indicated.

Use Simmance Patent "DEAD-BEAT" INDICATORS.

For indicating pressure and vacuum at each stage of manufacture these Indicators are unequalled for accuracy, reliability and long life.

They are of all-metal construction. Liquid, springs and gears have no place in the "Dead-Beat" system, the typical form of which is shown below.



ALEXANDER WRIGHT & Co LTD
1, WESTMINSTER PALACE GARDENS, VICTORIA STREET.
WESTMINSTER, S.W.1
Telephone: VICTORIA 1207.
Telegrams: PRECISION, SOWEST LONDON

WEST'S

for CARBONIZING PLANT——

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Forms of Tender may be had from the undersigned.

The sealed Tenders, endorsed "Tenders for Gas Coal," are to be addressed to The Chairman of the Gas Committee, Gas-Works, Arctic Road, Cowes, and delivered not later than the 9th of July, 1931.

The Council do not bind themselves to accept the lowest or any Tender.

R. A. GRETTON,
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ANDREW GRIERSON, S.S.C.,
Town Clerk.

City Chambers,
Edinburgh,
June 19, 1931.

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Dated this 20th day of June, 1931.

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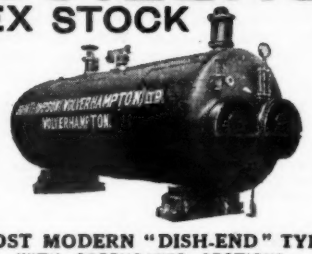

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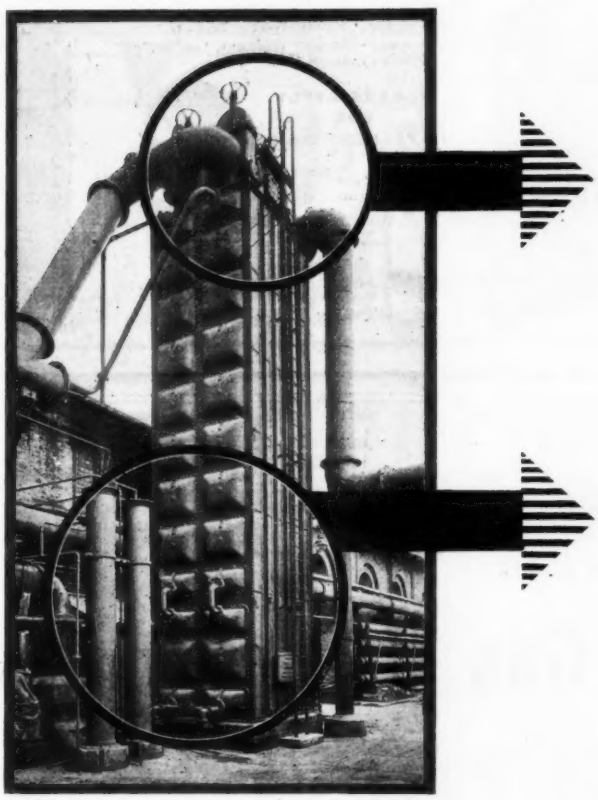

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FIG. 105

FIG. 256

FIG. 257

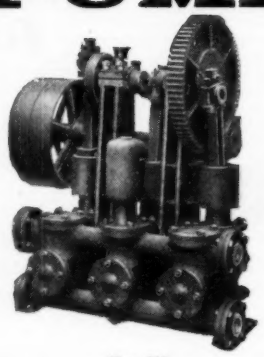
FIG. 842

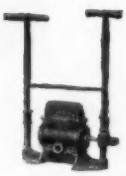
FIG. 187

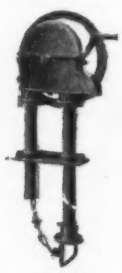
FIG. 69

FIG. 324

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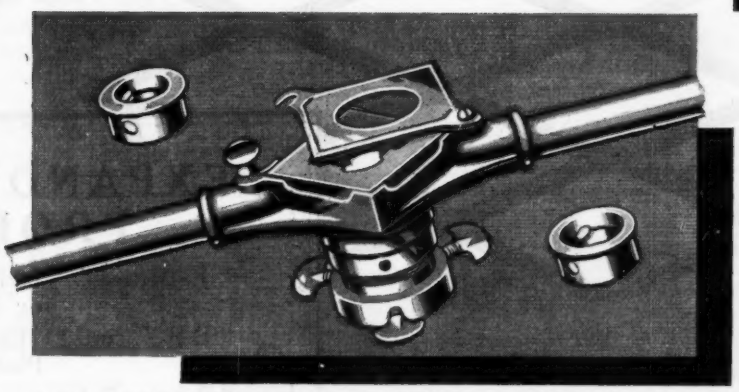

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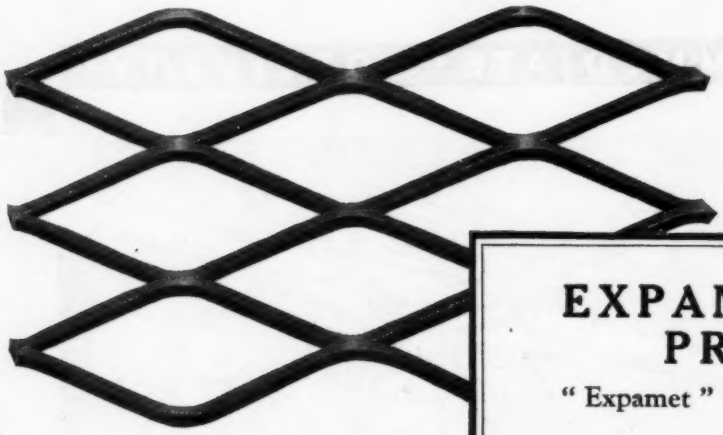

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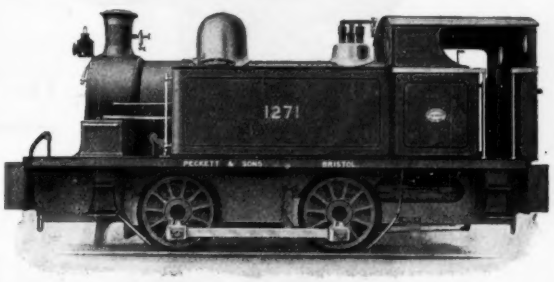

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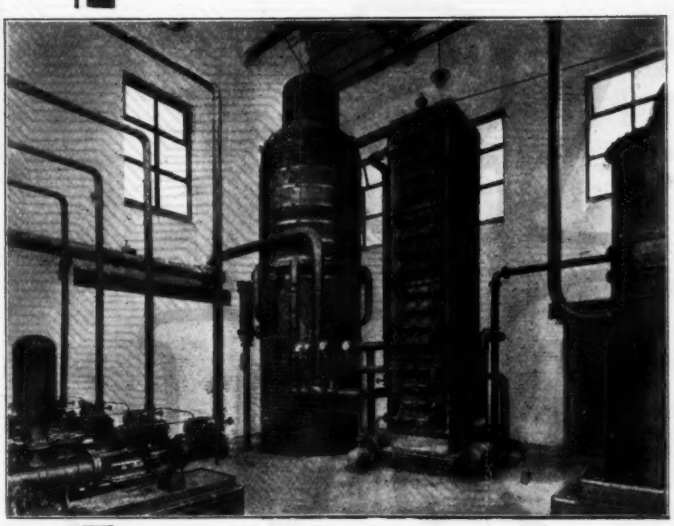

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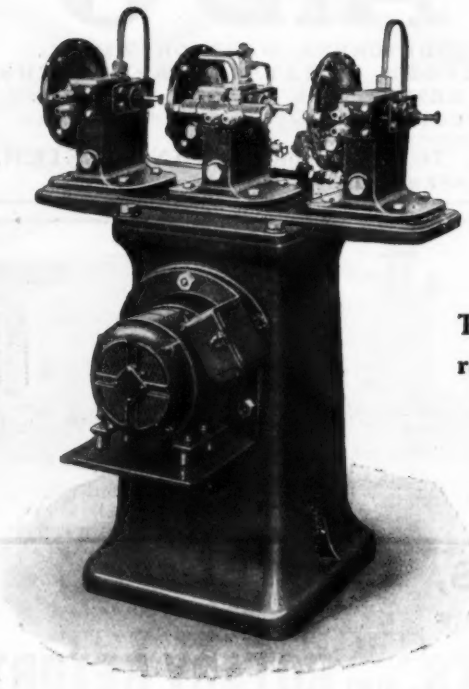

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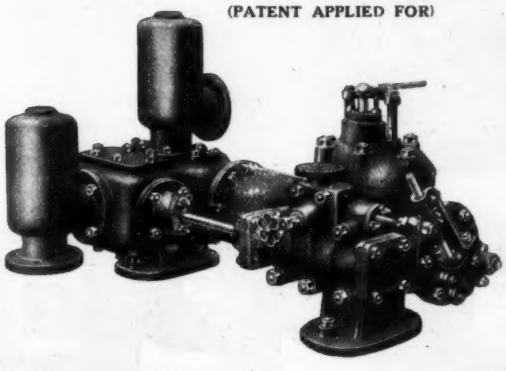

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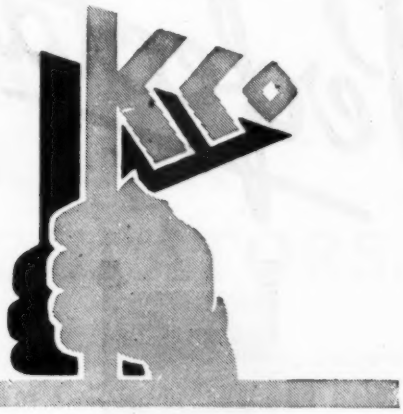

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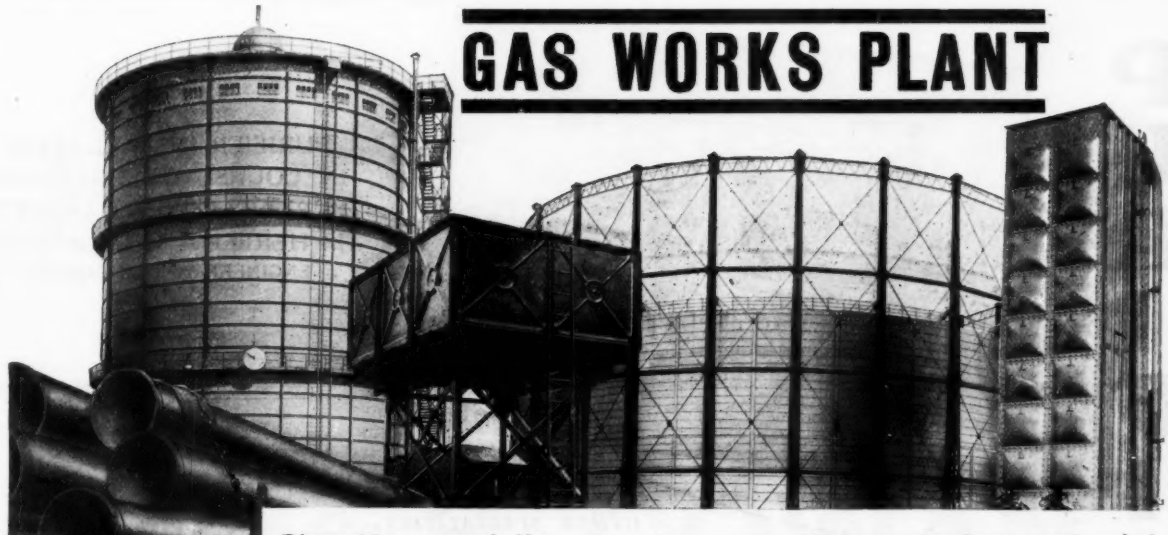

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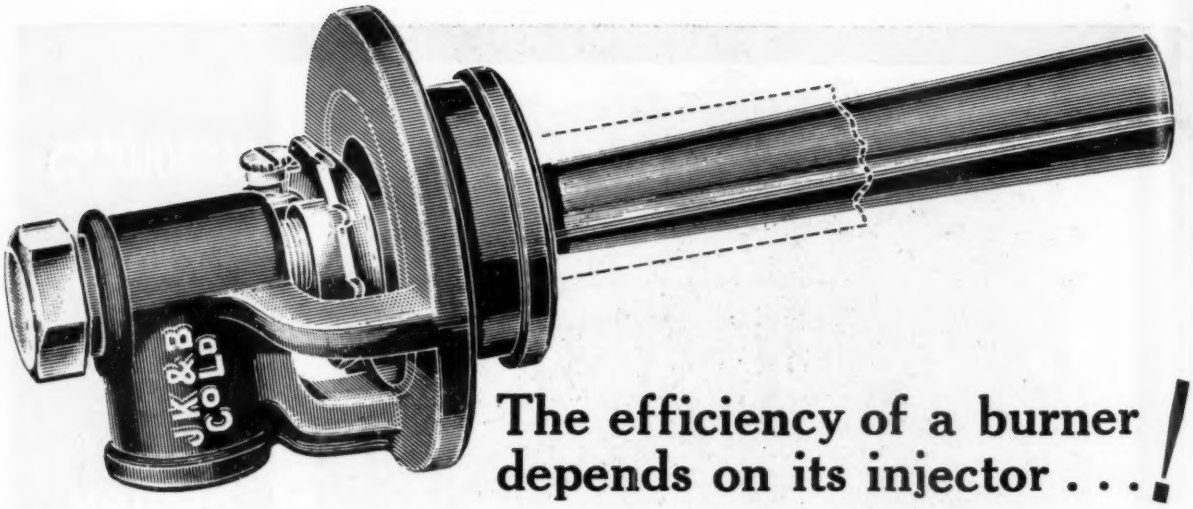

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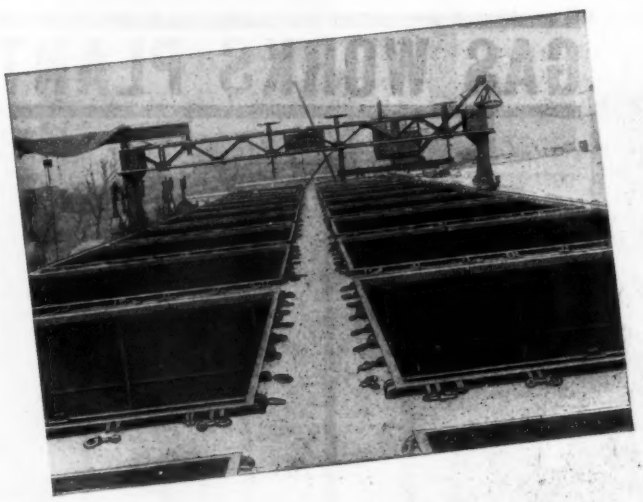

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